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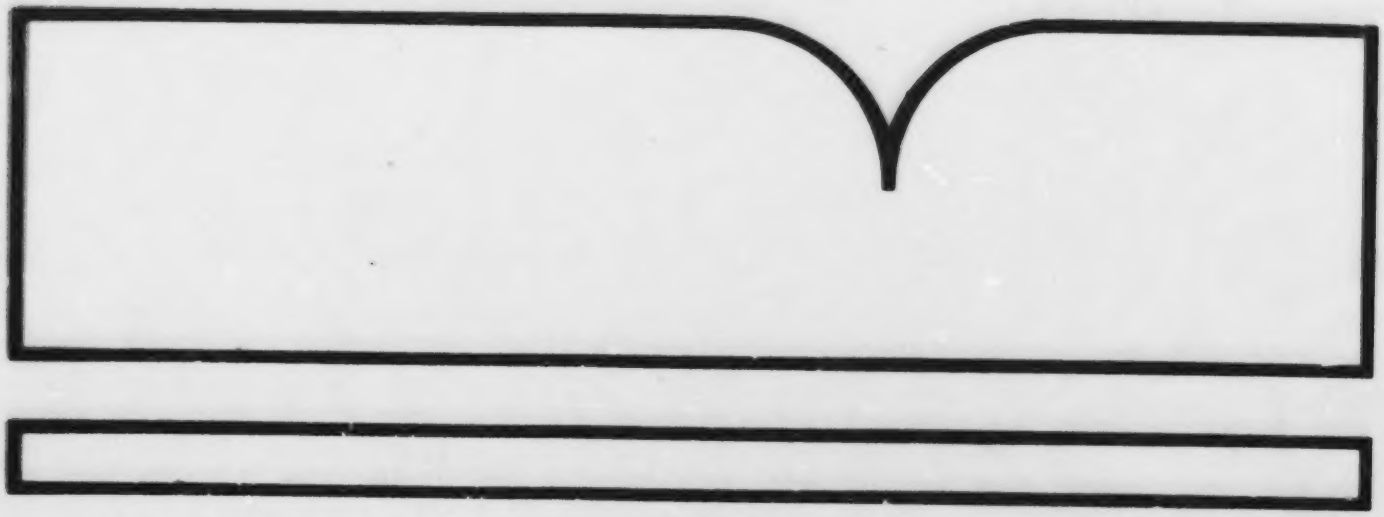
Pollution-Caused Fish Kills in 1963 (4th Annual Report)

(U.S.) Public Health Service
Washington, DC

1964



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This report is an analysis of pollution-caused fish kills compiled from data supplied by State officials. It includes analytical text and the following tables: summaries by State, sources, operations subgroup , water body, average number of fish killed, changes in aquatic food organisms, corrective action, severity, type of water, month, and duration. Also includes a cumulative listing of the reports received.

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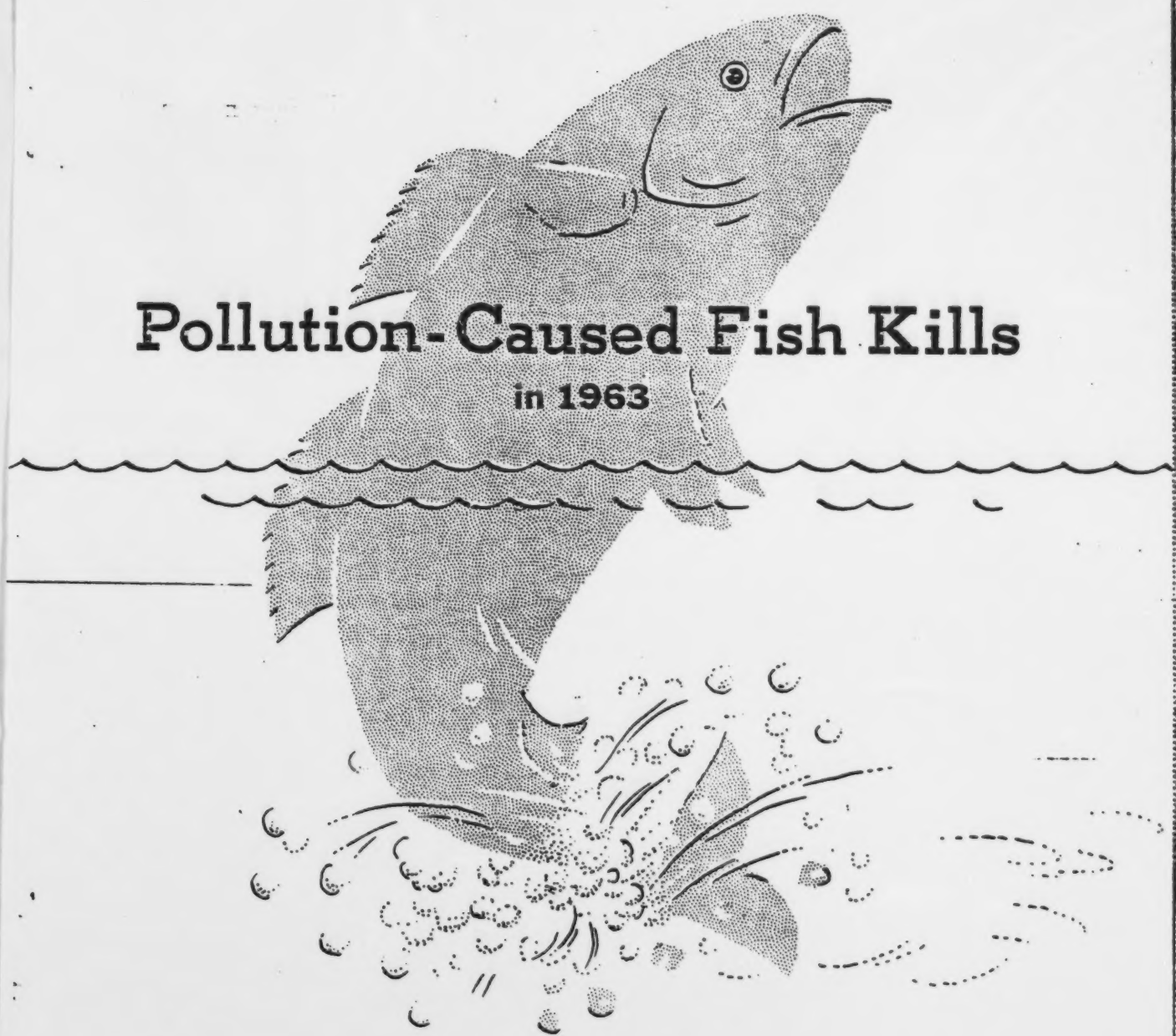

Pollution-Caused Fish Kills

in 1963

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Division of Water Supply and Pollution Control
Basic Data Branch
Washington, D.C. 20201

Public Health Service Publication No. 847

(1963 Edition)

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FOREWORD

A total of 6,816,530* fish were reported killed by water pollution in the United States in the year ending December 31, 1963, as compared to 6,200,000 the previous year. The latest count came from 300 of the 437 such reports filed by 39 of the 50 States. The average fish kill was 7,775. In the remaining 137 reports, the fish losses were expressed only in generalities such as "several thousand" or by tonnage. When these reports were assigned averages formulated from reports which did give actual counts, the estimated total fish kill went to 7,860,000.

This fourth annual fish kill report of the Public Health Service's Division of Water Supply and Pollution Control shows that pollutants arising from industrial operations led all categories both as to number of kills and number of fish. Agricultural operations, chiefly pesticides, were second in number. Municipal sewage, in dubious third place, was suspect, but could not be positively pinpointed, in the year's largest kill of 2 million fish. This kill was thus assigned to the "source unknown" category.

For the first time, this report categorizes pollution attributable to "transport operations" which accounts for accidental spills of chemicals and other toxic substances in transit. Usually such shipments are destined for industrial or agricultural uses, but deserve to be separated from pollution arising from such uses. The totals by categories follow:

Industrial operations: 139 reports accounting for 2,690,601 fish killed; agricultural operations: 54 reports accounting for 560,967 fish killed; municipal operations: 44 reports accounting for 914,379 fish killed; transport operations: 10 reports accounting for 78,388 fish killed; other operations: 15 reports accounting for 100,912 fish killed; pollution of unknown source: 38 reports accounting for 2,471,283 fish killed.

Although the 1963 data were incomplete on this point, the total stream mileage affected, when given, was 2,203 miles. In addition, 5,644 acres of lake and bay waters, plus 7 miles of shoreline waters, were affected by pollution involved in the fish kills.

The Public Health Service is grateful to the State fish and game agencies for their cooperation in collecting the data assembled in this report. The quality and thoroughness of the individual reporting by these State agency staffs have improved in each of the 4 years since the fish kill reports began.

*Estimated figures. See "Fish Kill Totals", p 7.

WHY COLLECT FISH KILL REPORTS?

The reporting of pollution-caused fish kills was begun by the Public Health Service June 1, 1960, in an attempt to secure additional information on the effects of pollutants discharged to surface waters. The principal objective was to determine, if possible, the causes of fish kills, and to place responsibility where it belonged if the kills were caused by manmade pollution.

The Surgeon General of the Public Health Service asked all State fish and game conservation agencies to assist him by reporting instances of fish kills attributable to pollutants. A self-addressed postcard reporting form was devised in cooperation with the U.S. Fish and Wildlife Service and the various independent conservation organizations. The form was furnished to the State agencies to be completed as occasions arose and mailed to the Public Health Service. Summary totals, statistical evaluations, and conclusions are based upon the information contained in these reporting forms.

The fish kill activity has completed its fourth year of operation. When initiated, the plan was to publish interim quarterly reports followed by cumulative annual summaries. With experience, however, it was found that the field reporting of kills was not prompt enough to warrant publishing of quarterly reports which could not, under the circumstances, reflect all kills occurring within the reporting period. Semiannual reports were published in prior years, but again the same problem presented itself: many of the reports were received too late to be accredited in the published data to the reporting period. A single report annually was therefore agreed upon as the publication frequency most likely to include complete data and otherwise satisfy the principal project objectives.

The point should be made that the pollution-caused fish kills reported herein probably represent only a fraction of those which actually occurred during the year. Numerous small kills resulting from pollution go unnoticed or unreported, and significantly large kills often are not included due to lack of sufficient information as to whether the kills were produced by pollutants or natural causes. It is difficult and often impossible to determine the actual cause of a kill. The most careful investigations and complete and analytical procedures often do not prove the cause, and many such occurrences are not reported. Fish kills are always with us. Because they are dramatic in effect they are usually reported in the daily press. A comparison of press clippings with State reports received illustrates the point that many kills are not reported.

On the other hand, it is believed that there are untold instances each year in which significant numbers of fish are killed by sudden and severe contamination of their habitats, and that these instances can be recorded and the pollutant and its source identified. It is felt that the reports can serve as an additional indicator of the trend in biological safety of the surface waters of the United States. Since the primary responsibility for reporting rests with the States, however, the success of the activity is proportional to the completeness of reporting by the State agencies.

NEW REPORTING FORM

The first 3 years' experience in using the first reporting form showed the desirability of revising certain portions of it. It was difficult on the original form to identify the activity or operation responsible for generating the pollutant reaching the stream. The revised form, reproduced as figure 1, places emphasis on the type of operation from which the pollutant stems, as well as the causative agent if known. The revised form shows four types of operations to which pollution-caused fish kills can usually be attributed: agricultural, industrial, municipal, or transport operations. Identification of the causative agent used in context with a particular operation provides the most accurate description of what has occurred. When classified in this manner the responsibility for fish kills can be more accurately placed. A troublesome point of confusion in the past was associated with the transport of chemicals and toxic substances. In the former reporting form, such a substance spilled into a river while in transit was listed as an industrial waste, when in fact it

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DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

Form Approved
Budget Bureau No. 68-R706

(WASHINGTON USE)

REPORT OF POLLUTION-CAUSED FISH KILL

1. LOCATION:
Stream or Lake _____
Nearest Town _____ State _____

2. DATE OF KILL: _____

3. TYPE WATER:
☐ Fresh ☐ Salt ☐ Estuary

4. SOURCE OF POLLUTION

a. AGRICULTURAL OPERATIONS
☐ Poisons (Herbicides, pesticides, etc.)
☐ Fertilizers
☐ Manure drainage, ensilage liquors, or feed lot operations.

b. INDUSTRIAL OPERATIONS
☐ Mining
☐ Food & kindred products
☐ Paper & allied products.
☐ Chemicals
☐ Petroleum
☐ Metals
☐ Other (specify) _____

c. MUNICIPAL OPERATIONS
☐ Sewerage system
☐ Refuse disposal
☐ Water system
☐ Swimming pool

d. TRANSPORTATION OPERATIONS
☐ Rail ☐ Barge or boat
☐ Truck ☐ Pipeline

☐ e. OTHER _____
☐ f. UNKNOWN (fold here)

g. SPECIFIC AGENT OR CAUSE, IF KNOWN: _____

5. TYPE OF FISH KILLED
_____% Game
_____% Non-game
100 % Total
_____% Commercial

6. ESTIMATED NUMBER KILLED _____

7. SEVERITY:
☐ Total ☐ Heavy ☐ Moderate ☐ Light

8. EXTENT: Miles of stream or acres of lake effected _____

9. DURATION OF CRITICAL EFFECT: _____ days _____ hrs.

REPORTING OFFICIAL

AGENCY MAILING ADDRESS

DATE

10. ADDITIONAL REMARKS: (State circumstances of kill; any visible effects of the pollution on water, or other details) _____

FIGURE I

should have been attributable to a transport operation.

The new form, with the approval of the Fish and Wildlife Service, was distributed at the end of 1962 and has been used throughout 1963 in reporting fish kills. As the reports are received from the States, copies are furnished to the Fish and Wildlife Service. Reports are excluded from the listing if it appears that the kill was not related to pollution. Some reports indicate kills that occurred too far in the past to determine the cause or extent. Other reports indicate that pollutants had been discharged but no fish were killed. Of the total number of reports received, however, only a small percentage are excluded from the summary.

Acceptable reports are coded for machine punchcard tabulation to obtain various statistical tables. The punchcard method permits the insertion of late reports in the sequence in which they occurred.

POLLUTIONAL SIGNIFICANCE

It is probable, as stated above, that many fish kills occur each year which are never observed or reported to authorities. It is also certain that many waters, long subject to continuous discharge of toxic wastes, are incapable of supporting fish life, and thus are not represented in the fish kill statistics. The kind of reporting represented in this publication, therefore, cannot serve as a

perfect indicator of the biological safety of our waters. Pollution-caused fish kill statistics can provide only a rough measure of the pollution itself. On the other hand, contaminants that damage commercial and sports fishing may also endanger wildlife, domestic livestock, and irrigated crops. Many substances, particularly synthetic organic liquid wastes, may pass unchanged through a water treatment plant, and thus may have public health implications. With some substances, the health implications are obscure. But because many fish kills are caused by severe man-made pollution of brief duration, reports of these incidents do provide a measure of trends in this aspect of the water pollution problem that cannot readily be developed in any other way.

Identifying a specific toxic substance may be an involved and frequently impossible procedure. The policy has been, nevertheless, to accept the opinion of the State representative and to list the information submitted as being the considered judgment of the initiating State agency. With hundreds of representatives reporting, from fish and game wardens to professional aquatic biologists, the details of the reports do vary widely. On the whole, however, they represent a convincing picture of careful field work on the part of the participants.

EXTENT OF COVERAGE

The fish kills reported during 1963 came from 39 States. With the exception of the District of Columbia which reported a fish kill in 1962, this is one more than the number of States reporting last year. With their usual cooperation, the sport fisheries and conservation organizations continued to encourage and stimulate interest among their members and the general public to report pollution-caused fish kills. Many factors influence fish kill reporting. In some States, extensive efforts are made to collect reports on all fish kills. In others, information is developed only where there is a legal prosecution. Not all States have the same area or quantities of surface water. Population densities and industrial and agricultural activities, all affecting water quality, differ from State to State.

States not reporting any fish kills in 1963 are: Alaska, Arizona, Delaware, District of Columbia, Maryland, Massachusetts, Mississippi, Nevada, New Mexico, North Dakota, South Dakota, and Wyoming. Three of these—Nevada, New Mexico, and North Dakota—did report that no known fish kills occurred. The remaining States listed did not submit reports of any kills related to pollution.

No State has been asked to modify its existing methods of self-notification, but only to pass on to the Public Health Service such information as was developed in connection with its normal operating procedures.

WELL-DOCUMENTED OR SIGNIFICANTLY LARGE KILLS

From time to time information is submitted to the Public Health Service in far more detail than is indicated on the reporting form. Occasionally all possible facts are acquired to document completely the discharge of a particular pollutant and its subsequent effects. Past reports have discussed individually and in detail pollution-caused kills of 1 million or more fish. Only one such kill was reported in 1963.

Following are details of some of the significant fish kills reported in 1963 as taken from the filed information:

Coweeman River near Kelso, Wash. An accidental break in a hose discharged 4,000 gallons of diesel oil into the Coweeman River on August 19, 1963. The oil came from an industrial corporation's 10,000-gallon tank located 17 miles upstream from Longview, Wash. Fisheries biologists from three State agencies and the industry itself investigated the kill and found that fish were completely eradicated or severely damaged along a 10- to 13-mile stretch of the river, and that kills occurred as far as 17 miles downstream from the discharge. There was also significant damage to aquatic food organisms and a major reduction of small aquatic insects, larvae, and nymphs.

The Washington State Department of Fisheries estimated that 30,000 fingerling silver salmon, 24,000 fingerling and yearling steelhead trout, and 5,000 cutthroat trout were killed, a total of 59,000 fish.

Following the kill, a company spokesman stated that immediate safety measures had been taken and additional precautions were being developed

to prevent a recurrence of similar mishaps.

Roanoke River near Weldon, N.C. (The following is reprinted from the *Sport Fishing Institute Bulletin*, No. 140, July 1963.)

An extensive kill of sea-run striped bass spawning stocks, channel catfish, and a variety of other species of fishes occurred in the Roanoke River, starting at Weldon, N.C., and proceeding a distance of 115 river-miles downstream below Jamesville, during the 1-week period April 21 through 28, 1963. Early notification of the kill was given by sport fishermen who first observed distress among the rockfish at about 3 a.m., Sunday morning, April 21, at the height of the "rock" fishing season. Fishery biologists of the Wildlife Resources Commission soon eliminated oxygen deficiency as the cause, leaving pollution as the probable cause.

Starting April 22, *THE NEWS AND OBSERVER* (Raleigh) carried almost daily accounts of the progress of the slug of toxic water downstream, and the progressive devastating kills, of striped bass and other fishes, and findings through May 8. In addition, the North Carolina Wildlife Resources Commission has issued a detailed multilithed report of seven pages, with illustrations and observed and estimated kill data for the various species, prepared by fishery biologists William B. Smith and Jack Bayless. It adds up to a grisly tale, especially so since it comes during the height of striped bass spawning and of the sport fishing season.

As nearly as could be determined at the outset, a large slug of poisonous material was dumped into the Roanoke River somewhere between the dam at Roanoke Rapids and Weldon late Saturday night, April 20. Near Weldon the polluted area was about a half mile in length. It proceeded downstream, taking a deadly toll until it passed below Jamesville about 115 miles downstream when it had increased in length to more than 11 miles and became diluted below toxic strength. The poisonous slug of water moved downstream at an average rate of about 15 miles per day. Where up to around 300 people fishing for striped bass are customarily counted daily in the Weldon area of the river during the peak of the season, all fishing had ceased.

Governor Sanford called for "complete and thorough investigation" by State wildlife, pollution, health, and water resource officials, and for "recommendations of such action as may be indicated, including possible legal action." He explained (in part): "The fact that the current pollution of the Roanoke River is killing fish is bad, because fishing is one of the chief attractions in North Carolina's third largest money-producing industries, the travel industry."

The biological study report prepared by the Wildlife Resources Commission fishery biologists following their weeklong investigation confirmed early reports by anglers and extended the details. The number of striped bass known through direct observation to be dead was set at 6,721. Additional striped bass killed but not counted due to removal by people and scavengers and failure to rise to the surface or trapped in marginal snags below the water surface were estimated to be fully twice as numerous as those actually counted. The total estimate of striped bass killed was placed between 18,000 and 22,000, collectively weighing between 37 and 45 tons! Average weight was a bit under 4 pounds, with many females (nearly 16 percent of the total killed and averaging about 8 pounds), some weighing up in the 10- to 35-pound range, apparently killed in the act of spawning.

The report concluded that the kill of an estimated 3,160 females deprived the 1963-year class of the support of about 1.6 billion eggs. What effect this will have on future years' fishing remains to be seen. For one thing, fish chief Harry Cornell said he thought that a substantial portion of this season's migration might have been out of harm's way in Albemarle Sound at the time and may now be enroute upriver to the spawning grounds above Weldon.

In addition, some 25,000 to 30,000 channel catfish aggregating some 10,000 pounds were killed at the same time. Other fishes killed probably totaled 5,000 pounds or more in all.

THE NEWS AND OBSERVER (Raleigh) for May 8, reported that it had finally been determined that the ——— Paper Co. was responsible for the latest big rockfish kill (meat value alone being estimated at $50,000; with potential sport fishing business values possibly threefold that figure).

In a report to the State stream sanitation committee, Executive Secretary Earle C. Hubbard said the lethal poison came from an accidental spillage from a large tank on the paper company's property. His report said that analysis of samples taken from the river revealed the presence of lethal quantities of resin acid soaps, and that the pulp

and paper mills are the only source of resin acid soaps in the Roanoke Rapids area. The report also stated that it was definitely established that an accidental spill of wastes containing such soaps occurred when the "black liquor feed tank" spilled over for 8 minutes from about 1:45 a.m. to about 1:53 a.m. on Sunday, April 21. The overflow, estimated to be from 10,000 to 15,000 gallons, ran down a ditch and into the river. (End of SFI Bulletin reprint.)

W. E. Knight of the North Carolina Wildlife Resources Commission estimated on the reporting form that a total of 100,000 fish were killed, 90 percent of which were game fish.

Wahiawa Reservoir near Wahiawa, Hawaii (Oahu Island). Mr. Kenji Ego, Chief, Fisheries Branch, Division of Fish and Game, Hawaii State Department of Land and Natural Resources, reported the largest fish kill of the year suspected of being pollution related. He estimated that 2 million fish were killed in the Wahiawa Reservoir. Except for about a dozen largemouth bass, the kill was almost exclusively of threadfin shad. Interviews held with fishermen ultimately revealed that threadfin shad first began dying in the late afternoon of December 20, 1963. The Division of Fish and Game was not notified immediately and it was not until December 23 that the kill was investigated. By then the fish were in an advanced state of decomposition.

Inasmuch as the kill occurred within a limited area of the reservoir and in the near vicinity of the Wahiawa sewage treatment plant (complete treatment), there is the possibility that some substance toxic to fish may have been discharged through the outfall. Positive evidence to support such suspicion was not uncovered, however, and the source of the pollution is listed in the record as "Unknown". An analysis for chlorinated hydrocarbon pesticides made by the Hawaii State Department of Health using gas chromatographic procedures was negative.

Investigation of Fish Kills on the Lower Mississippi. Of all the fish kills reported in 1963, the one which perhaps will have the most far-reaching effect because of its obvious implications was reported by Louisiana and involved intermittent but repeated fish kills in the lower Mississippi River. Early in December 1963, officials in Louisiana asked the Public Health Service to investigate fish deaths in the lower Mississippi River and the gulf coast. These deaths have occurred each year since 1960 during the fall and winter months and were particularly serious this year. Informal estimates place the numbers of fish killed during this 4-year period at close to 7 million, with over 6 million being salt water fish. The deaths were noticed when water temperatures dropped to around 20° C., were not continuous but intermittent, and of no set pattern. In the fresh water areas, bottom-feeding fish seemed to be affected, whereas in brackish areas the surface feeders were affected.

Three months of intensive investigations were carried on by Public Health Service scientists. An effort was made to investigate all possible causes of the fish deaths. It was established by the U.S. Fish and Wildlife Service that the kill was not due to parasitic or bacterial disease. No evidence was found of botulism. An analysis of fish tissue for toxic metals, using an emission spectrograph, also gave negative results. Environmental conditions, such as low dissolved oxygen and drastic temperature changes, were ruled out.

A statement issued jointly by the Public Health Service and the Louisiana Wild Life and Fisheries Commission pointed out that several toxic synthetic organic compounds were found, including the pesticides, endrin and dieldrin, used to protect midwestern and southern crops. Examination of the dead and dying fish, of bottom muds, and of the river water itself showed the presence of a number of toxic synthetic organic materials. Recently developed techniques using gas chromatographic equipment, preceded by thin-layer chromatography, and confirmed where possible by infrared spectroscopy, have enabled the Public Health Service to detect and measure several of these highly toxic substances in quantities as low as fractions of micrograms per liter. The identifications were made independently by five teams of investigators, four within the Public Health Service and one a private research group. These toxic pollutants appear to be the cause of the massive fish kills.

It was established that the levels of organic chemicals in public drinking water supplies in the Mississippi River Basin do not present any immediate health problem. However, the Public Health Service has now increased its regular monitoring of these drinking waters.

As an immediate result of these findings, the Public Health Service's Division of Water Supply and Pollution Control, in cooperation with the

States of the lower Mississippi basin, established a continuing study to determine the water pollution control measures necessary to protect the waters in the basin. Scientists and engineers assigned to the area will be supported by several laboratories of the Public Health Service. Other Federal, State, and local agencies are expected to participate in this effort.

ENLISTING FISHERMEN SUPPORT

The State of Pennsylvania has been exceptionally diligent in attempting to control water pollution. It has also been particularly interested in preventing the needless killing of fish by careless or negligent discharge of pollutants to surface waters. Good laws and effective implementation have resulted in ever-increasing awareness on the parts of municipalities and industries to the dangers of discharging toxic substances to streams.

The Pennsylvania Department of Health, in cooperation with the Pennsylvania Fish Commission and the Pennsylvania Federation of Sportsmen's Clubs, has issued and distributed a wallet-sized pamphlet called "How To Improve Your Fishing by Reporting Fish Kills." To encourage sportsmen to report observed fish kills, the pamphlet contains instructions on how to collect water samples, gummed labels with space for identifying information to paste on the sample container, and the telephone numbers of the regional offices of the fish commission and health department for every county in the State. The fisherman is urged to telephone the proper authority if he observes a fish kill, any unusual color or odor in a stream, or if he sees fish in distress. He is also urged to keep the pamphlet with his fishing license, and to take appropriate action as an individual to help end pollution and the fish kills.

Citing the Pennsylvania endeavor as an example of what States can do, the magazine *Sports Afield* published in its January 1964 issue an article titled "Be a Pollution Detective." It encouraged all States and all sport fishermen to engage in similar action, relying on aroused fisherman-sportsman groups to enlist the entire citizenry in helping abate water pollution. Reprints of "Be a Pollution Detective" were widely distributed by the Public Health Service.

MONETARY DAMAGES FOR POLLUTION-CAUSED FISH KILLS

Six States are known to collect monetary damages for fish killed by pollution. They are Pennsylvania, Illinois, Wisconsin, Virginia, California, and North Carolina (new act of June 1963).

When a fish kill is reported in Pennsylvania, an immediate investigation is made by the fish commission, the department of health, or both. Number, size, kind, and cause of the kill are determined. Value of the fish killed is set by a schedule established by the fish commission. In 1963, from a total of 89 cases, voluntary contributions amounting to $18,111.94 were received in 57 cases; there were 10 prosecutions ($2,200) and 22 cases were pending at end of year or dismissed for insufficient evidence or no fish killed. (Not all of these kills were reported for inclusion in this summary.)

Illinois follows a similar plan, working closely with the health department. In 1963, 34 kills were reported on the fish kill reporting cards. An estimated 721,729 fish were killed with a total value of $80,329.28. The sum of $32,900 has been collected; other settlements are pending. With sufficient evidence, Illinois has not found it necessary to take a monetary recovery case through the courts. A section of the Illinois law grants authority to recover payment without resort to court action.

Wisconsin follows much the same pattern with a majority of its settlements made out of court, although several court cases have resulted in collection of damages up to several thousands of dollars.

Virginia and California have both collected large sums for fish kills in recent years. About 4 years ago, Virginia claimed the loss of some 500,000 fish and set a value of $150,000 on them The case was settled out of court with a sizable percentage recovery. California was awarded more than $13,000 for a kill of some 2,000 striped bass.

The North Carolina act, a strong one passed

only in June 1963, was stimulated by the massive Roanoke River kill of striped bass, as documented elsewhere in this report.

Most States have laws prohibiting the killing or taking of fish with poison, electricity, dynamite, and so forth, and in some each affected fish may be the basis for a separate charge. Such cases are handled as criminal actions.

THE DATA

Fish Kill Totals. For 1963, 39 of the 50 States submitted 437 notifications of pollution-caused fish kills.[1] Of these, 300 reported a total of 6,816,530 fish killed. (See table 1.) Many of the others gave an unquantifiable indication such as "thousands," "tons," or gave figures in pounds. These 136 reports are shown in the Cumulative Listing, but the column "Estimated number of fish killed" is left blank.

While the number reported is an estimate, some States have rather elaborate and carefully-thought-out procedures to arrive at a figure. The number as reported is used throughout this publication. *No artificial degree of accuracy is implied by this procedure.* It does, however, avoid the troublesome problem of balancing rounded figures between tables.

As reported by 325 notifications, 2,203 miles of river were affected as were 5,644 acres of lake or bay and 7 miles of shoreline.

Sources of Pollution. Because of the new procedure in classifying pollution sources, as discussed earlier, it is not possible to make accurate comparisons with data for other years. Of the 436 reports, 194 attributed the pollution source to "industrial operations" (table 2) and 139 of the 194 reported a total of 2,690,601 fish killed. The "agricultural operations" category was second in number of reported kills, but the second largest in number of fish was given on the "source unknown" reports. In the "unknown" category, it should be noted, was the Wahiawa Reservoir incident, previously discussed, in which 2 million fish were killed. Had it been placed in its suspect category, then "municipal operations" would supersede all others in the pollution source categories.

The average fish kill is placed at 7,775. This is 2,000 larger than last year. This average and that for each pollution category was derived after eliminating 12 reports each listing 100,000 or more fish killed. Pollution from industrial operations accounted for the largest fish kill average, nearly 9,000. The "transport" category was responsible for an over-7,800 average, and the remaining 4 categories were grouped at around 6,700 in the fish kill averages.

Assuming that the reports not giving a specific number of fish killed did in fact kill the average number, it is possible to estimate that a total of 7,860,000 fish were killed in the 436 incidents reported. This compares with 7,118,000 as reported for 1962.

The cumulative punchcard tabulation codifies the individual subgroup pollutants reported as responsible for the fish kills. Table 3 draws these together. Insecticides and other poisons from agricultural operations had the largest number (60) of reports. Of these, 37 reports accounted for 401,415 fish. In another tabulation, not shown, there were 80 reports involving the same substances, with 52 of them accounting for 491,221 fish. These 80 reports included the 60 for agricultural operations directly, plus 20 others that name poisons as the specific agent. Examples of these are municipal spraying for mosquito or weed control, vandalism, poaching, or accidental overdosing for fish control.

In the subgroupings the largest number of fish were reported killed by petroleum operations which include drilling, pumping, or refining. In the separate tabulation mentioned, oil and/or gasoline figured in 28 reports, with 19 of them reporting 1,232,038 fish. Some of these were caused by pipeline ruptures, truck wrecks, or other accidents. In one a storm sewer opening was unfortunately mistaken for an oil delivery opening and the whole truck load was delivered—into the stream.

Faulty or inadequate sewerage system operations had the second largest number of reports (50) as well as number of fish killed, 904,767 accounted for by 37 notifications.

Type of Fish Killed. Respondents were asked to make a percentage breakdown of the game fish

[1] One report from Colorado received too late to be used in the analyses.

and forage fish killed. Altogether 403 did so, including 294 who also gave numbers for each type. On the basis of these percentages and numbers, it is estimated that the 7,860,000 total kill would divide into 967,000 game fish and 6,893,000 forage fish. Only in the "transportation operations" category were more game than forage fish killed. The two fish types were equally divided in the "other operations" category.

Respondents were also asked to estimate the percentage of the total kill which was of commercial value. Unfortunately these estimates were too infrequent to allow any total estimate. It should be pointed out, however, that none of the commercial value answers given was zero.

Type of Water Body. Table 4 presents data as to type of water body in which the kills occurred. As might be expected, most of the kills were in rivers and streams. The 271 responding on this point reported 2,203 stream-miles affected. This averages 8.1 miles per kill. The comparable average for 1962 was 5.6 miles. Slightly over 3 million fish were reported killed in lakes and reservoirs. Included here is the 2 million kill in the Wahiawa Reservoir in Hawaii. Of the 1,235,800 fish reported killed in bays, 9 notifications applying to Los Angeles Harbor accounted for 1,215,390. This same number applies to salt water kills in table 5.

Other Data. Table 6 shows the distribution of notifications and number of fish killed by month. The three summer months June–August accounted for almost half of the year's reports, although more fish were reported killed in September than in all of the 3 preceding months.

Table 7 gives a distribution of reported duration by type of operation. Not counting three reports which listed "2 to 3" months and each of which is recorded as 75 days, the average duration of critical effect was 3.18 days. The average for 1962 was 2.59 days. The average for agricultural operations was 3.21 days, while the industrial operations average was 3.72 days, or almost 12 hours longer. The remaining groups ranged between 2 and 3 days.

Response as to the severity of damage is shown in table 8. Although only 300 respondents gave a number of fish killed, 419 expressed a judgment as to the severity of the kill. Heavy kills were indicated in 44 percent of the replies. One in seven was considered total, one in four moderate, and one in five light. The lower portion of the table shows the percentage of positive responses for each operations group.

When severity and duration were related, as in table 9, it will be seen that for 309 responses which could be paired, the average time of critical effect decreases as the severity decreases, from 4.02 days for total kills to 2.34 days for light kills.

Table 10 shows the number of definite replies to selected questions and how the percentage of each relates to the total returns. The best response was to the severity, 96 percent, followed closely by type of fish, 92 percent. Except for the item on commercial fish, which was answered by only 18 percent of the respondents, response percentages were in the 60's and 70's.

By dividing these 1963 percentages by those for 1962, it is possible to make a judgment as to the quality of reporting. Any result over 100 is an improvement. There was an increase of 14 percent in the number of reports and, with the exception of one at 99, all ratio-relatives indicate an improvement. While much has been said about the number of reports with no number of fish, the positive reporting had the highest improvement.

THE TENUOUS LIFE LINE FOR FISH

In surface waters constantly loaded with municipal, industrial, and agricultural wastes, the life of fish is dependent upon successfully avoiding water damaged by careless acts, accidents, whimsy, and sometimes total negligence. Nowhere is this better illustrated than in the actual comments and remarks contained in the fish kill reports. It has become a practice in this publication to include a sampling of these comments to illustrate the seriousness of the problem. The comments appearing below are in most cases direct quotes from the reporting forms:

- - - - - - - - - - - - - - - - - - - -

Airplanes had been spraying soybeans for "corn ear worms" all week. A 2- to 3-inch rain caused a large runoff. Whiskey Chute River rose about 18 inches. Dead fish were observed in all ditches and streams leading into the upper end of Whiskey Chute and the progress of the kill was followed

from the upper end of the Chute to the lower end where it empties into White River. Estimated number killed: 1,000.

A cotton fungicide and repellant was washed from cotton seed during an acid delinting process. It then passed through an inadequate sewage treatment plant. Fish showed an oversecretion of mucus on the exterior of their bodies which eventually covered the gill filaments causing suffocation. Estimated number killed: several thousand.

Aerial application of DDT on a cotton field bisected by irrigation canal resulted in losses within several hours for over 2 miles downstream. Plane apparently made passes the full length of the field without regard to the 10-foot-wide canal and the water surface received the normal land rate application. Estimated number killed: 12,500.

Herbicide was applied to an irrigation canal for weed control. In the past, this was done without any fish kill. This time at water temperature 84° F., it killed 300 largemouth bass, 500 bluegill, 200 bullheads, and 4,000 threadfin shad. Total estimated kill: 5,000.

Copper salts in lethal concentrations were released from abandoned mines. Copper levels ranged from 0.05 to 1.8 mg/l. Fish in distress twirled at the surface with death occurring in a few minutes. Estimated number killed: 100,000.

Lumber mill was using sodium pentachlorophenate as a log dip. Apparently an unknown amount of this material was lost into the stream. Adult and juvenile frogs were killed as well as fish. Estimated number killed: 1,000.

Kill occurred in irrigation canal probably as a result of refilling spray rig from canal using suction hose which drained to the canal before picking up suction into the tank. Estimated number killed: 18,000.

Area is chronically polluted due to oil refinery and chemical plant wastes. Wastes are known to be toxic and have high B.O.D. and C.O.D. Fish enter during warm period when oxygen levels are most critical and toxicity is increased. Estimated number killed: 148,000.

A plant of 2,000 brown trout was made the day before the kill occurred. Formaldehyde resin was discharged to the stream. These discharges have existed for a good number of years. Since kills of this sort are occurring regularly, the stream will no longer be stocked with trout. Thus, another sizable stream affording many hours of pleasure has been lost to the stench of civilization. Estimated number killed: over 1,000.

A 16-inch pipeline carrying petroleum products ruptured. The oil company made every effort to confine the petroleum products, mainly gasoline, and remove oil and gas emulsion along with pickup of dead fish. Oil company was to settle with Home-owners Association. Estimated number killed: 1,089.

The fish kill extended over a 2-week period. Flushing action of the fire department washed waste material from a milk company cheese plant into the stream. The estimated value of the fish loss was $3,520.26. Estimated number killed: 15,983.

The South Fork has had chronic acid mine wastes polluting the stream for several years. The company responsible has spent and is spending a considerable amount of money to clay cap slag and gob. Improved methods and closer guidance necessary. Total value of fish life lost is estimated at $20,252.10. Estimated number killed: 121,353.

This kill was suspected to be caused by metal plating wastes which were bypassed to the stream from the city sewer. City officials are working to determine the source of these wastes and to eliminate the bypassing. Estimated number killed: unknown but light.

A 100-pound punctured drum of cyanogas was thrown into the stream by unknown persons. Estimated number killed: unknown but light.

Source of pollution is ammonia wastes. Owners of fertilizer plant were not aware that cleanup waters would materially affect fish life. They agreed to stop discharging these waters to the stream. Estimated number killed: unknown but heavy.

A cannery lagoon valve was opened and the wastes from the lagoon were discharged to the stream. Estimated number killed: unknown but moderate.

Fish kill resulted from the dumping of approximately 10,000 gallons from a hog sewage tank where it would drain into creek. The slug traveled approximately 1½ miles, appearing as a gray cloudy mass with a distinctive odor. Estimated number killed: 3,000. The same farmer pumped the contents of the same hog sewage tank 1 month later. Fewer fish were killed because of the complete kill the first time.

This kill was caused by the illegal use of rotenone for the purpose of obtaining fish. Estimated number killed: 1,000.

Tank trucks in which liquid fertilizer is diluted for spray was flushed into a storm sewer system. Estimated number killed: 500.

Rainfall, just adequate to wash manure from cattle feedlot into the watercourse, occurred in the area. Water became black and very odorous with the smell of manure. Estimated number killed: 8,000.

Kill was caused by oxygen deficiency due to heavy B.O.D. of potato processing wastes. Estimated number killed: 50.

All fish were killed when spray equipment was cleaned in an impoundment area. Spray contained 2,4–5 T. Estimated number killed: 50.

Discharge from this small abandoned coal mine has caused pollution of creek for years. Impoundment of these wastes at the mine is needed. Estimated number killed: 5,000.

Discharge of the alkali fly ash water into this canal has caused fish kills in the past. A better method of waste disposal is needed at this plant. Estimated number killed: 1,500.

Three thousand gallons of fuel oil were dumped into the sewer and ended up in the creek. The oil would not burn properly in the standby fuel oil system. At the same time the creek was frozen solid. Estimated number killed: several thousand.

Malfunction in the operation of the sewage treatment plant digester resulted in the release of sludge into the stream for several days. The substance lay in pools and under the ice from December 1962 to February 1963. Estimated number killed: 1,500.

Fish kill occurred overnight from irrigation runoff of dieldrin-treated land. Fat and liver analysis by gas chromatograph showed 0.02 ppm concentration of dieldrin. Shoreline seining 2 weeks later produced one crappie. Estimated number killed: over 600 pounds of bass, bluegill, and crappie.

Leak in fuel line allowed Bunker or No. 6 fuel oil into cooling water which is discharged into creek. Material is very difficult to remove. Estimated number killed: 100.

Tank truck was making a home delivery when spillage occurred. It was washed down storm drain by local fire department and thence to river. Also killed some ducks. Estimated number killed: 50.

Driver making delivery to storage tank backed into filler pipe. About 3,000 to 4,000 gallons escaped and some went through storm drain into lake. Estimated number killed: 50.

Drums of DDT spray and oil are kept on streambank for convenience in making up spray solutions. Vandals are alleged to have pushed the drums into stream. Estimated number killed: 2,000.

Beet processing wastes are discharged to the village sewage system. Because of high B.O.D. and dry weather conditions in the stream, the fish kill extended gradually for about 3½ miles downstream. Estimated number killed: 45,000.

Farmer bought corn husks from canning company and filled his silo which has a concrete bottom. Corn husk liquor drained to stream adjacent to barnyard. Estimated number killed: 4,500.

Sodium hydroxide lost due to defective valve in a storage tank. The kill appeared to be complete over the first 4 to 5 miles. Took several days for the discharge to be diluted sufficiently. Estimated number killed: 40,000.

County road repair crew was observed pouring "bitch mold," an asphalt patching compound, into the streams, apparently to get rid of it. The observed dead fish were mostly juvenile silver salmon and rainbow trout. Estimated number killed: 200.

A private pond was treated with 50 pounds of commercial insecticide powder to kill a catfish population. About a one-quarter acre-foot was released 2 days following the treatment. Fish kill was complete for about a quarter of a mile downstream. Species killed were coho salmon, rainbow and cutthroat trout, cottids, and crayfish. Estimated number killed: 2,000.

Distributor was filling storage tanks in basement of private home when the end completely blew out of both tanks. Oil went from spring ditch into creek. Area is stocked with catfish. Estimated number killed: several hundred.

Water was pumped from stream to fill spray truck and spilled approximately 1 gallon of dieldrin. The stream was affected for 100 yards. Estimated number killed: 1,758.

Water in the damage zone was brown and oily. Fish were struggling to keep alive by leaping to the water surface in what appeared to be a gasp for air. Samples collected and analyzed indicated presence of cyanide. Estimated number killed: 200.

The kill was caused by a farmer washing out a spray rig in the creek on his property. The area was stocked with trout. Frogs, snakes, salamanders, and aquatic insects were killed in addition to fish. Estimated number killed: 20,000.

The fish kill was caused when a fuel oil truck delivered 2,650 gallons of fuel oil to an elementary school. Instead of pumping oil into storage tank, entire 2,650 gallons was pumped into storm drain discharged into Standing Stone Creek. Nine miles of stream were damaged. The stream was stocked with trout. Estimated number killed: 11,924.

The pollution was traced to a farm where a drum containing an insecticide was found along a ditch leading to the stream. The drum had a large hole on the top. Marks on the top of the drum indicated someone had dumped this on the bank of the ditch. The farmer remarked: "The kids must have done it." Estimated number killed: 4,120.

The kill was caused by drainage coming from an open silo containing pea vines. It ran out a break in the lower lagoon. The farmer assured repairs and also that he would pump it into a tank and haul it away in the future. Estimated number killed: 2,775.

Oil company was draining condensate from storage tanks. Valve was locked open and 5,000 to 15,000 gallons escaped. Traces were found 15 miles from the point of entry. Estimated number killed: 4,000.

Chemical company accidentally spilled butonal alcohol from a tank truck, which escaped down drainage ditch to creek. Estimated number killed: 1,650.

Soybean oil spilled from a tank car damaged in a train wreck was permitted to flow into the creek. The streamflow was below normal because of recent dry weather. All aquatic life was killed. Estimated number killed: several thousand.

Employee of a pet food company let fuel oil pump run all night and from 400 to 1,000 gallons of oil entered the stream. All fish and insect life killed. Estimated number killed: unknown but total.

A wreck on the railroad involved several cars, including two tank cars of liquid and 1 box car of plastic beads. The liquid was described as a type of photofinishing fluid. The tank cars were drained of the remaining contents so that they could be replaced on the rails. The types of fish killed were largemouth bass, bluegill, rock bass, catfish, carp, drum, and shad. Estimated number killed: 5,000.

The kill was caused by the burning of a fertilizer and feed warehouse. Insecticides and fertilizers were washed into the stream. Estimated number killed: 3,000.

Decomposing sewage was flushed down the stream during a recent heavy rainfall. This probably depleted the dissolved oxygen in the area resulting in a heavy fish mortality. A new plant or improvements in the existing plant is badly needed. It is hoped that the publicity on this fish kill will induce the people to vote for the bond issue to finance the above facilities. Estimated number killed: 5,000.

(*Editor's Note:* This municipality now has an application pending for a Federal grant to construct new sewage treatment facilities.)

TABLE 1.—*Pollution-caused fish kill summary by State*

	Total number of reports	Reporting number of fish killed		Extent of damage					
		Number of reports	Number of fish	Miles of river		Acres of lake		Miles of shore	
				Number of reports	Miles	Number of reports	Acres	Number of reports	Miles
Alabama	2	1	350	2	6				
Arkansas	14	2	100, 150	3	200	9	491		
California	24	21	1, 362, 230	11	23	10	2, 051	1	1
Connecticut	5	5	10, 133	4	8				
Florida	2	2	100, 000	2	10				
Georgia	9	3	40, 200	5	47	2	41		
Hawaii	2	2	2, 002, 000	1	1	1	75		
Idaho	2	2	30, 000	1	20			1	2
Illinois	34	31	721, 729	28	192	4	365		
Indiana	13	1	15, 715	10	40				
Iowa	19	13	83, 200	12	39				
Kansas	9	8	138, 500	9	49				
Kentucky	1		(*)	1	40				
Louisiana	7	2	70, 000	6	597				
Maine	11	5	15, 250	6	41	1	1, 702		
Michigan	8	7	18, 146	3	4				
Minnesota	8	3	11, 500	6	18	1	20		
Missouri	15	13	63, 950	12	60	1	1	1	1
Montana	2	1	4, 000	1	2				
Nebraska	7	2	2, 400	4	14	1	3		
New Hampshire	3		(*)	3	63				
New Jersey	20	16	10, 424	7	8	2	3		
New York	24	22	383, 225	19	73	1	10		
North Carolina	5	5	110, 000	5	118				
Ohio	17	17	187, 431	12	38				
Oklahoma	1								
Oregon	11	9	12, 525	8	26	1	6		
Pennsylvania	52	38	253, 954	39	157			1	1
Rhode Island	4	3	14, 000	1	20	2	151		
South Carolina	1	1	30, 000	1	10				
Tennessee	13	10	672, 137	6	28	4	423		
Texas	57	33	61, 620	22	154	9	302	1	2
Utah	8	3	5, 175	2	4				
Vermont	1			1	1				
Virginia	5	5	113, 000	3	17				
Washington	10	7	63, 585	6	23				
West Virginia	8	5	108, 700	7	49				
Wisconsin	2	2	1, 300	2	3				
Total	436	300	6, 816, 530	271	2, 203	49	5, 644	5	7

*Number of fish not reported. (See p. 7 of text.)

TABLE 2.—*Fish kill summary by source of pollution*

Source of pollution	Number of reports	Reporting number of fish killed		Average size of kill [1]	Estimated number of fish killed		
		Number of reports	Number of fish		Total [2]	Game	Forage
Agricultural operations	84	54	560, 967	6, 655	761, 000	182, 000	579, 000
Industrial operations	194	139	2, 690, 601	8, 995	3, 185, 000	433, 000	2, 752, 000
Municipal operations	60	44	914, 379	6, 615	1, 020, 000	48, 000	972, 000
Transportation operations	17	10	78, 388	7, 840	133, 000	115, 000	18, 000
Other operations	27	15	100, 912	6, 725	182, 000	91, 000	91, 000
Unknown	54	38	2, 471, 283	6, 740	2, 579, 000	98, 000	2, 481, 000
Total	436	300	6, 816, 530	7, 775	7, 860, 000	967, 000	6, 893, 000

[1] Average derived after excluding 12 reports over 100,000.
[2] Includes all fish killed as reported, plus the average number killed for each source applied to those reports where no actual number was given.

TABLE 3.—*Summary of fish kills by operations subgroup*

Source of pollution	Number of reports	Reporting number of fish	
		Number of reports	Number of fish
Agricultural operations:			
Insecticides, poisons, etc.	60	37	401, 415
Fertilizers	3	2	1, 400
Manure-silage drainage	21	15	158, 152
Subtotal	84	54	560, 967
Industrial operations:			
Mining	16	12	330, 815
Food and kindred products	47	31	428, 271
Paper and allied products	14	9	171, 878
Chemicals	34	29	224, 441
Petroleum	14	10	1, 156, 900
Metals	18	13	93, 798
Other	24	16	136, 625
Combinations	8	5	20, 650
Unidentified	19	14	127, 193
Subtotal	194	139	2, 690, 601
Municipal operations:			
Sewerage systems	50	37	904, 767
Refuse disposal	3	3	6, 800
Water systems	3	3	1, 312
Power	4	1	1, 500
Subtotal	60	44	914, 379
Transportation operations:			
Rail	2	1	5, 000
Truck	8	6	71, 899
Barge or boat	1		
Pipeline	6	3	1, 489
Subtotal	17	10	78, 388
Other operations	27	15	100, 912
Unknown source	54	38	2, 471, 283
Total	436	300	6, 816, 530

TABLE 4.—*Fish kill summary by type of water body*

Type of water body	Total number of reports	Reporting number of fish killed		Extent of damage					
		Number of reports	Number of fish	Miles of river		Acres of lake		Miles of shore	
				Number of reports	Miles	Number of reports	Acres	Number of reports	Miles
River	357	247	2, 500, 600	271	2, 203	----	----	----	----
Lake	63	38	3, 080, 069	----	----	36	4, 443	4	5
Bay	16	15	1, 235, 800	----	----	13	1, 201	1	2
Total	436	300	6, 816, 530	271	2, 203	49	5, 644	5	7

TABLE 5.—*Fish kill summary by type of water*

Type of water	Total number of reports	Reporting number of fish killed	
		Number of reports	Number of fish
Fresh	405	274	5, 478, 130
Salt	16	15	1, 234, 300
Brackish	15	11	104, 100
Total	436	300	6, 816, 530

TABLE 6.—*Fish kill summary by month*

Month	Total number of reports	Reporting number of fish killed	
		Number of reports	Number of fish
January	14	8	26, 588
February	21	13	149, 452
March	23	13	110, 041
April	17	11	143, 033
May	31	20	74, 009
June	70	48	321, 793
July	68	50	470, 311
August	73	54	927, 981
September	48	35	1, 930, 405
October	36	26	367, 596
November	20	12	96, 390
December	15	10	[1] 2, 198, 931
Total	436	300	6, 816, 530

[1] One report of 2,000,000 fish.

TABLE 7.—*Frequency distribution of reported duration of critical effects*

[Number of reports showing kills lasting indicated number of days]

Days	All reports	Agricultural operations	Industrial operations	Municipal operations	Transportation operations	Other operations	Unknown
<1	49	3	24	7	1	8	6
1	91	18	37	14	3	8	11
2	65	17	28	7	4	1	8
3	34	10	17	2	2	1	2
4	11	1	6	1	1	----	2
5	12	2	6	2	1	1	----
6	3	1	1	----	----	----	1
7	14	1	8	3	----	----	2
8	5	----	3	2	----	----	----
9	----	----	----	1	----	----	----
10	7	1	3	----	----	2	----
12	2	----	1	----	1	----	----
14	4	1	2	----	----	----	1
16	1	----	1	----	----	----	----
17	2	----	2	----	----	----	----
18	1	1	----	----	----	----	----
25	1	----	1	----	----	----	----
30	3	1	2	----	----	----	----
31	1	----	1	----	----	----	----
75	3	----	----	1	----	----	2
Total	309	57	143	40	13	21	35
Average	3.18	3.21	3.72	2.64	3.00	2.00	2.36

TABLE 8.—*Responses as to severity of damage*

Source	All reports	Total kill	Heavy kill	Moderate kill	Light kill	No response
Agricultural operations	84	13	39	16	14	2
Industrial operations	194	29	80	47	29	9
Municipal operations	60	5	33	11	11	----
Transportation operations	17	1	6	2	7	1
Other operations	27	6	7	8	3	3
Unknown	54	2	20	17	13	2
Total	436	56	185	101	77	17
Percent of Responses						
Agricultural operations	100.0	15.8	47.6	19.5	17.1	----
Industrial operations	100.0	15.7	43.2	25.0	15.7	----
Municipal operations	100.0	8.3	55.0	18.3	18.3	----
Transportation operations	100.0	6.2	37.5	12.5	43.8	----
Other operations	100.0	25.0	29.2	33.3	12.5	----
Unknown	100.0	3.8	38.5	32.7	25.0	----
Total	100.0	13.4	44.1	24.1	18.4	----

TABLE 9.—*Distribution of duration by severity of kill*

Duration days	All responses	Total kill	Heavy kill	Moderate kill	Light kill	Not stated
<1	49	4	15	18	11	1
1	91	12	34	25	20	----
2	65	7	30	15	12	1
3	34	5	19	6	4	----
4	11	1	7	3	----	----
5	12	2	4	3	3	----
6	3	----	2	1	----	----
7	14	4	6	2	1	1
8	5	2	2	1	----	----
9	----	----	----	----	----	----
10	7	2	3	1	----	1
12	2	----	1	----	1	----
14	4	1	2	1	----	----
16	1	----	1	----	----	----
17	2	----	2	----	----	----
18	1	----	1	----	----	----
25	1	----	----	1	----	----
30	3	1	1	1	----	----
31	1	----	----	----	1	----
75 [1]	3	----	1	2	----	----
Total	309	41	131	80	53	4
Average	3. 18	4. 02	3. 42	2. 77	2. 34	----

[1] Not used in deriving averages.

TABLE 10.—*Summary of fish kill responses*

[Number of positive responses]

Source	Total	Agent	Severity	Extent	Duration	Number of fish	Type of fish	Percent commercial
Agricultural operations	84	69	82	60	57	54	70	8
Industrial operations	194	136	185	155	143	139	183	40
Municipal operations	60	33	60	44	40	44	54	16
Transportation operations	17	14	16	14	13	10	13	2
Other operations	27	21	24	18	21	15	23	1
Unknown	54	15	52	33	35	38	52	11
Total	436	288	419	325	309	300	403	78
Percent of All Returns								
Agricultural operations	100. 0	82	98	71	68	64	83	10
Industrial operations	100. 0	70	95	80	74	72	94	21
Municipal operations	100. 0	55	100	73	68	73	90	27
Transportation operations	100. 0	82	94	82	76	59	76	12
Other operations	100. 0	78	89	67	78	56	85	4
Unknown	100. 0	28	96	61	65	76	96	20
Total	100. 0	66	96	74	71	69	92	18
Ratio of 1963 to 1962	(114)	108	102	99	101	116	111	----

REPORT OF POLLUTION-CAUSED FISH KILLS

CUMULATIVE LISTING OF REPORTS RECEIVED AS OF DATE OF LISTING

RIVER OR LAKE AFFECTED	NEAREST TOWN OR CITY	DATE OF KILL: MONTH	DAY	YEAR	OPERATIONS INDICATED AS RESPONSIBLE FOR KILL: GROSS GROSS BILLION	TYPE OF FISH KILLED: % INDUSTRY GAME	% COMMERCIAL FORAGE	PERCENT OF KILL WHICH WAS OF COMMERCIAL VALUE	ESTIMATED NUMBER OF FISH KILLED	SEVERITY: TOTAL (1)	HEAVY (2)	MODERATE (3)	LIGHT (4)	ESTIMATED MILES OR ACRES AFFECTED	DURATION OF PRINCIPAL KILL: DAYS	HOURS
ALABAMA																
MOORES CREEK	LANGDALE	9	4	63	90	53%	47%	-	350	1				3M	1	-
SHADES CREEK	MOUNTAIN BROOK	9	23	63	31	75%	25%	-	-		2			3M	1	-
ARKANSAS																
WHITE RIVER	BUSCH	11	8	63	50	25%	75%	-	-		2			-	-	-
WHISKEY CHUTE	ELAINE	7	30	63	11	25%	75%	-	100,000		2			42A	6	-
JONES LAKE	EL DORADO	7	14	63	90	10%	90%	-	-			3		-	2	-
GRAND LAKE	EUDORA	8	27	63	11	90%	10%	-	-		2			60A	-	-
LONG LAKE	GRADY	8	3	63	11	10%	90%	-	-		2			20A	2	12
ROLLING FK LITL R	HORATIO	12	20	63	23	30%	70%	-	-		2			15M	4	-
LAKE CHICOT LOWER	LAKE VILLAGE	8	10	63	11	30%	70%	-	-				4	5A	2	-
LAKE CHICOT UPPER	LAKE VILLAGE	8	11	63	11	100%	-	-	-				4	2A	2	-
LAKE CHICOT LOWER	LAKE VILLAGE	8	29	63	11	30%	70%	-	-		2			10A	2	-
LAKE CHICOT UPPER	LAKE VILLAGE	9	-	63	11	40%	60%	-	-		2			12A	-	-
LAKE ERLING	LEWISVILLE	8	16	63	90	30%	70%	-	-		2			40A	4	-
VILLAGE CREEK	NEWPORT	2	10	63	28	1%	99%	95%	150	1				5M	3	-
LAKE JUNE	STAMPS	1	-	63	35	40%	60%	-	-		2			300A	10	-
BAYOU METO	STUTTGART	3	26	63	24	15%	85%	70%	-		2			180M	3	-
CALIFORNIA																
F CANAL 6-8TH AVE	BLYTHE	10	2	63	90	75%	25%	-	-				-	1M	-	-
RICE CANAL	DOS PALOS	8	6	63	11	1%	99%	-	12,500		2			3M	1	2
POZO CANAL	FIREBAUGH	9	-	63	11	30%	70%	-	3,500				4	3M	-	-
BASIN DOMNGZ GAP	LONG BEACH	1	-	63	11	88%	12%	-	-		2			1M	7	-
TRIB TUOLUMNE RIV	MODESTO	9	7	63	90	70%	30%	-	2,000			3		2M	-	6
REDWOOD CREEK	NAPA	6	17	63	33	100%	-	-	300		2			1M	1	-
PEDRO CREEK	PACIFICA	6	7	63	12	100%	-	-	400		2			1M	1	-
TRIB PALOVRDE LAG	PALO VERDE	9	12	63	90	75%	25%	-	500			3		-	1	-
CANAL TRIB COLG R	PALO VERDE	9	28	63	11	-	100%	-	-		2			2M	-	12
SC FORK TULE REV	PORTERVILLE	8	14	63	90	20%	80%	-	5,000			3		1M	1	-
[illegible] LAKE	REDDING	2	2	63	21	-	100%	-	100,000		2			1,000A	10	-
CEDAR CREEK	REDDING	8	27	63	28	80%	20%	-	10,000	1				3M	7	-
REDWOOD CREEK	REDWOOD CITY	6	19	63	31	100%	-	-	30				4	1M	-	6
SAN FRANCISCO BAY	SAN BRUNO	5	22	63	24	1%	99%	90%	3,500		2			200A	2	-
UNNAMED CANAL	TRANQUILITY	7	19	63	11	17%	83%	-	18,000		2			5M	1	-
LOS ANGELES HARB	WILMINGTON	8	2	63	27	-	100%	100%	1,070			3		10A	-	-
LOS ANGELES HARB	WILMINGTON	8	15	63	27	10%	90%	90%	8,230		2			8A	-	-
LOS ANGELES HARB	WILMINGTON	8	20	63	27	-	100%	100%	5,000		2			34A	-	-
LOS ANGELES HARB	WILMINGTON	8	23	63	25	-	100%	100%	148,000				-	126A	-	-
LOS ANGELES HARB	WILMINGTON	8	29	63	25	-	100%	100%	19,000		2			20GA	-	-
LOS ANGELES HARB	WILMINGTON	9	19	63	25	-	100%	100%	682,000		2			40GA	-	-
LOS ANGELES HARB	WILMINGTON	9	20	63	25	-	100%	100%	252,000				-	34A	-	-
LOS ANGELES HARB	WILMINGTON	9	23	63	22	-	100%	100%	50,000		2			-	-	-
LOS ANGELES HARB	WILMINGTON	9	24	63	25	-	100%	100%	50,000		2			39A	-	-
COLORADO																
WILLIAMS FORK R	HAMILTON	11	11	63	25	-	-	-	-				-	16M	-	-
CONNECTICUT																
BROAD BROOK	BROAD BROOK	4	15	63	26	5%	95%	-	133				4	1M	-	5
SHETUCKET RIVER	OCCUM	7	22	63	23	5%	95%	-	7,500		2			-	3	-
QUINNIPIAC RIVER	SOUTHINGTON	7	11	63	20	-	100%	-	1,000				-	2M	-	4
BEE BROOK	WASHINGTON	6	7	63	13	25%	75%	-	500		2			1M	3	-
WILLAMANTIC RIVER	W WILLINGTON	4	8	63	24	100%	-	-	1,000		2			4M	2	-

10 Agricultural Operations
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12 Fertilizer
13 Manure, Silo, Feedlot Drainage, etc.

20 Industrial Operations
21 Mining
22 Food & Kindred Products
23 Paper & Allied Products
24 Chemicals
25 Petroleum
26 Rubber
27 Stone, Clay & Glass
28 Primary Metals
29 Other

30 Municipal Operations
31 Sewerage System
32 Refuse Disposal
33 Water Supply
34 Sewage Plant
35 Power

40 Transportation Operations
41 Rail
42 Truck
43 River or Bay
44 Pipe Line

50 Other Operations
99 Unknown

REPORT OF POLLUTION-CAUSED FISH KILLS

CUMULATIVE LISTING OF REPORTS RECEIVED AS OF DATE OF LISTING

RIVER OR LAKE AFFECTED	NEAREST TOWN OR CITY	DATE OF KILL: MONTH	DAY	YEAR	OPERATIONS INDICATED AS RESPONSIBLE FOR KILL (SEE CODES BELOW)	TYPE OF FISH KILLED: PERCENT GAME	PERCENT FORAGE	PERCENT OF KILL COMMERCIAL VALUE	ESTIMATED NUMBER OF FISH KILLED	SEVERITY: TOTAL (1)	HEAVY (2)	MODERATE (3)	LIGHT (4)	ESTIMATED MILES OR ACRES AFFECTED	DURATION OF CRITICAL EFFECT: DA	HR
FLORIDA																
ESCAMBIA RIVER	PENSACOLA	6	27	63	28	15%	85%	10%	90,000		2			5M	1	-
ESCAMBIA RIVER	PENSACOLA	7	16	63	28	5%	95%	1%	10,000			3		5M	-	6
GEORGIA																
ALLEN CLOUGH-POND	BROXTON	3	18	63	13	50%	50%	-	10,000	1				-	-	-
SPRING LAKE	CORDELE	11	24	63	22	60%	40%	-	-	1				40A	3	-
CHATTAHOOCHEE RIV	FT GAINES	6	15	63	35	5%	95%	90%	-		2			10M	7	-
CABIN CREEK	GRIFFIN	6	13	63	28	50%	50%	-	-		2			15M	2	-
PERRY ROUNTREE	METTER	4	26	63	11	100%	-	-	30,000	1				-	-	-
OKAPILCO CREEK	MOULTRIE	4	21	63	24	50%	50%	-	200				4	7M	-	-
POND	RENTZ	3	17	63	13	100%	-	-	-			3		1A	-	-
CANOOCHEE RIVER	SWAINSBORO	6	15	63	28	50%	50%	-	-		2			5M	2	-
APALACHEE RIVER	WINDER	11	19	63	27	30%	70%	-	-	1				10M	3	-
HAWAII																
KAPALAMA CANAL	HONOLULU	5	20	63	22	1%	99%	-	2,000			3		1M	5	-
WAHIAWA RESERVOIR	WAHIAWA OAHU	12	21	63	90	-	100%	-	2,000,000		2			75A	1	-
IDAHO																
MILNER RESERVOIR	BURLEY	2	5	63	22	-	100%	-	20,000		2			2M	30	-
BEAR RIVER	SODA SPRINGS	2	28	63	21	10%	90%	-	10,000			3		20M	-	-
ILLINOIS																
SALT CREEK	BROOKFIELD	11	11	63	90	8%	92%	92%	1,197		2			3M	2	12
RICHLAND CREEK	BUENA VISTA	5	26	63	31	15%	85%	31%	327				4	3M	1	-
KICKAPOO CREEK	CHARLESTON	11	2	63	26	6%	94%	4%	15,362	1				7M	4	-
EMBARRASS RIVER	CHARLESTON	11	5	63	26	29%	71%	22%	40,837		2			12M	14	-
MACKINAW RIVER	COLFAX	8	17	63	13	30%	70%	20%	4,528		2			2M	3	-
REESE CREEK	DUQUOIN	2	5	63	31	16%	84%	78%	2,227		2			4M	2	-
OTTER CREEK SO BR	DURAND	6	8	63	22	2%	98%	45%	-		2			11M	1	-
PECATONICA RIVER	FREEPORT	7	23	63	90	47%	53%	32%	37,974		2			20M	-	12
HORSESHOE LAKE	GRANITE CITY	5	4	63	26	84%	16%	16%	10,141			3		150A	4	-
HORSESHOE LAKE	GRANITE CITY	8	15	63	24	70%	30%	3%	7,076			3		200A	2	-
BUCK CREEK	GRIDLEY	8	7	63	22	10%	90%	10%	3,536	1				2M	2	-
SANGAMON RIVER	HARRISTOWN	7	3	63	31	11%	88%	18%	17,575			3		10M	8	-
GOLFVIEW LAKE	HINSDALE	5	17	63	44	56%	44%	44%	1,089			3		12A	3	12
NO FK VERMILION R	HOOPESTON	9	3	63	22	38%	62%	65%	42,114			3		6M	4	12
ILL R LAGRANGE LK	LAGRANGE	7	1	63	90	-	100%	-	290				4	-	2	-
SALT CREEK	LINCOLN	7	2	63	31	3%	97%	100%	16,355		2			6M	1	-
KICKAPOO CREEK	LINCOLN	7	2	63	90	4%	96%	100%	34,795		2			2M	1	-
CERNAK QUARRY	LYONS	11	7	63	90	43%	57%	61%	1,120		2			3A	-	-
NO BR ROCK CREEK	MANTENO	9	13	63	13	-	100%	1%	9,310		2			1M	3	-
BAY CREEK	PITTSFIELD	9	1	63	22	25%	75%	-	15,983		2			15M	16	-
BEAVER CREEK	POPLAR GROVE	6	4	63	31	8%	92%	38%	3,647		2			6M	2	-
RICHLAND CREEK	RED OAK	7	30	63	22	4%	96%	96%	702		2			1M	-	12
KYTE CREEK	ROCHELLE	8	7	63	22	1%	99%	48%	1,247		2			1M	1	-
SO FK SANGAMON R	ROCHESTER	7	2	63	21	32%	68%	80%	2,375				4	9M	5	-
ROCK CREEK	ROCK CITY	5	25	63	22	1%	99%	90%	2,400		2			3M	5	-
ROCK RIVER	ROCKFORD	7	30	63	90	54%	46%	18%	31,000			3		6M	-	11
ROCK RIVER	ROCKFORD	8	26	63	31	11%	89%	51%	62,568		2			7M	-	20
ROCK RIVER	ROCKFORD	9	7	63	35	15%	85%	83%	-				4	1M	-	12
FOX RIVER	ROCKFORD	9	16	63	31	15%	85%	73%	9,321				4	6M	-	9
SANGAMON RIVER	SOUTH ELGIN	8	16	63	24	29%	71%	54%	1,500				4	-	-	-
SANGAMON RIVER	SPRINGFIELD	7	17	63	31	31%	69%	43%	3,168			3		6M	1	-
KISHWAUKEE S&E BR	SPRINGFIELD	8	9	63	21	63%	37%	85%	121,353		2			30M	3	-
SPOON RIVER	SYCAMORE	8	8	63	90	13%	87%	56%	228,612		2			10M	-	18
	WYOMING	4	12	63	20	1%	99%	13%	-			3		6M	1	-

10 Agricultural Operations
11 Pesticide Manufacturing Formulation, etc.
12 Fertilizers
13 Manure, Silo, Feedlot Drainage, etc.

20 Industrial Operations
21 Mining
22 Food & Kindred Products
23 Paper & Allied Products
24 Chemicals
25 Petroleum
26 Metals
27 Combinations
28 Other

30 Municipal Operations
31 Sewerage System
32 Refuse Disposal
33 Water System
34 Swimming Pool
35 Power

40 Transportation Operations
41 Rail
42 Truck
43 Barge or Boat
44 Pipe Line

50 Other Operations

99 Unknown

REPORT OF POLLUTION-CAUSED FISH KILLS

CUMULATIVE LISTING OF REPORTS RECEIVED AS OF DATE OF LISTING

STREAM OR LAKE AFFECTED	NEAREST TOWN OR CITY	DATE OF KILL: MONTH	DAY	YEAR	OPERATIONS CREDITED OR RESPONSIBLE FOR KILL (SEE CODES BELOW)	TYPE OF FISH KILLED: PERCENT GAME	PERCENT FOOD AND FORAGE	PERCENT OF KILL KNOWN USE OF COMMERCIAL VALUE	ESTIMATED NUMBER OF FISH KILLED	SEVERITY: TOTAL (1)	HEAVY (2)	MODERATE (3)	LIGHT (4)	ESTIMATED VALUE OF FISH AFFECTED	DURATION OF TOXIC EFFECT: DA	HRS
INDIANA																
WHITE RIVER	ANDERSON	2	15	63	31	-	-	-	-				4	1M	1	-
WHITE LICK CREEK	BROWNSBURG	12	1	63	31	-	-	-	-				4	3M	1	-
WILLIAMS CREEK	CONNERSVILLE	6	27	63	50	-	-	-	-				4	1M	1	-
HENDERSON LAKE	KENDALLVILLE	2	18	63	31	-	-	-	-				4	1M	1	-
MONTGOMERY DITCH	KENTLAND	5	22	63	24	-	-	-	-		2			-	-	-
PLEASANT LAKE	LAKEVILLE	5	26	63	12	-	-	-	-		2			3M	1	-
DEER CR KOKOMO	MIAMI	6	30	63	13	-	-	-	-				4	-	1	-
MAUMEE RIVER	NEW HAVEN	6	25	63	22	-	-	-	-		2			4M	1	-
ROCK CREEK	PLUM TREE	10	28	63	22	-	-	-	-		2			3M	1	-
EAGLE CREEK	SPEEDWAY	3	11	63	50	10%	90%	-	-			3		8M	2	-
EAGLE CREEK	SPEEDWAY	10	11	63	50	-	-	-	15,719		2			-	1	-
WHITE RIVER	WAVERLY	11	25	63	31	-	-	-	-			3		1M	1	-
COAL CREEK	WAYNETOWN	6	5	63	31	1%	99%	-	-			3		15M	2	-
						-	-	-	-			3		1M	1	-
IOWA																
BLACK HAWK CREEK	DIKE	5	23	63	31	15%	85%	-	1,000	1				3M	1	-
STREAM TRIB WAPSC	ELMA	7	6	63	90	25%	75%	-	-		2			-	2	-
WOLF CREEK	GLADBROOK	7	1	63	11	-	-	-	1,000	1				-	3	-
BLACK HAWK CREEK	GRUNDY CENTER	7	27	63	90	50%	50%	-	-		2			-	-	-
ELK RUN CREEK	IOWA FALLS	8	6	63	13	-	100%	-	3,000	1				2M	1	12
ELK RUN CREEK	IOWA FALLS	9	9	63	13	-	100%	-	-		2			-	3	12
IOWA RIVER	LISCOMB	8	25	63	50	10%	90%	-	1,000			3		3M	-	6
LOWER SILVER CR	MALVERN	9	5	63	11	40%	60%	-	-		2			3M	-	-
IOWA RIVER	MARSHALLTOWN	8	24	63	50	10%	90%	-	1,000			3		3M	-	4
NO RACCOON RIVER	MINBURN	9	15	63	50	5%	95%	-	1,000			3		-	-	-
KITTY CREEK	MONTICELLO	5	24	63	42	-	100%	-	500				4	1M	-	1
RACCOON RIVER	NEWELL	11	23	63	31	1%	99%	-	10,000		2			8M	3	-
BEAVER CREEK	PERRY	9	9	63	31	1%	99%	-	-		2			-	-	-
FLOYD RIVER	PLYMOUTH CO	7	30	63	90	-	100%	-	50				4	1M	-	-
FLOYD RIVER	PLYMOUTH CO	8	1	63	11	3%	97%	-	150			3		1M	-	-
WALNUT CREEK	RED OAK	7	21	63	11	10%	90%	-	500	1				2M	2	-
SABULA LAKE	SABULA	7	2	63	50	80%	20%	-	54,000		2			-	1	-
PONY CREEK	ST OLAF	7	-	63	22	10%	90%	-	-		2			4M	-	-
BIG PAINT CREEK	WATERVILLE	5	17	63	31	-	100%	-	10,000		2			8M	5	-
KANSAS																
W FK DRYWOOD CR	ARCADIA	9	4	63	21	20%	80%	-	4,000	1				1M	8	-
BIG CREEK	ELLIS	7	30	63	22	5%	95%	-	2,000	1				2M	-	12
N HACKBERRY CR	GOVE	7	19	63	10	3%	97%	-	-		2			14M	2	12
COWSKIN CREEK	HAYSVILLE	2	5	63	24	10%	90%	2%	4,000		2			7M	-	-
COWSKIN CREEK	HAYSVILLE	5	30	63	24	15%	85%	-	1,000			3		2M	1	-
COWSKIN CREEK	HAYSVILLE	7	15	63	24	5%	95%	-	4,000		2			7M	-	-
SPRING CREEK	PECK	8	4	63	24	60%	40%	-	500			3		2M	2	-
TRIB S FK NIN R	PRATT	6	17	63	13	40%	60%	-	8,000		2			4M	4	-
LEVEL CR W FK CR	WHITE CITY	10	21	63	13	8%	92%	-	115,000	1				10M	5	-
KENTUCKY																
TENN OHIO RIVERS	PADUCAH	5	1	63	20	5%	80%	10%	-		2			40M	2	-
LOUISIANA																
BAYOU GR CAILLOU	DULAC	6	27	63	11	20%	80%	30%	-		2			7M	2	-
BAYOU BLACK	HOUMA	6	28	63	11	10%	90%	20%	20,000		2			5M	2	-
MISSISSIPPI RIVER	LAKE PROVIDENCE	10	15	63	90	10%	90%	80%	-			3		350M	75	-
LAKE CATAHOULA	ST MARTINVILLE	6	16	63	11	20%	80%	60%	-		2			-	-	-
CHACAHOULA CANAL	SCHRIEVER	6	22	63	11	20%	80%	30%	90,000		2			10M	2	-
ATCHAFALAYA RIVER	SIMMESPORT	10	15	63	90	10%	90%	80%	-			3		175M	75	-
OUACHITA RIVER	STERLINGTON	7	19	63	20	10%	90%	30%	-		2			50M	3	-

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34 Sewage Treatment Plant
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43 Barge or Boat
44 Pipe Line

99 Other Operations
99 Unknown

REPORT OF POLLUTION-CAUSED FISH KILLS

CUMULATIVE LISTING OF REPORTS RECEIVED AS OF DATE OF LISTING

RIVER OR LAKE AFFECTED	NEARBY TOWN OR CITY	DATE OF KILL MONTH	DAY	YEAR	OPERATIONS INDICATED AS RESPONSIBLE FOR KILL (SEE CODES BELOW)	TYPE OF FISH KILLED: GAME	TYPE OF FISH KILLED: FORAGE	PERCENT OF KILL WHICH WAS OF COMMERCIAL VALUE	ESTIMATED NUMBER OF FISH KILLED	SEVERITY: TOTAL (1)	SEVERITY: HEAVY (2)	SEVERITY: MODERATE (3)	SEVERITY: LIGHT (4)	ESTIMATED VALUE OF FISH AFFECTED	DURATION OF CHEMICAL EFFECT: DA	DURATION OF CHEMICAL EFFECT: MI
MAINE																
KENNEBEC RIVER	BATH	7	-	63	31	-	-	-	-		2			25M	-	-
ST CROIX	CALAIS	7	28	63	23	-	100%	-	-		2			5M	2	-
CARIBOU STREAM	CARIBOU	6	17	63	22	15%	85%	-	-		2			5M	2	-
LITTLE MADAWASKA	CARIBOU	6	25	63	90	-	100%	-	-		2			4M	1	-
SEBASTICOOK	DETROIT	10	-	63	31	-	100%	-	-		2			-	-	-
BROWN BROOK	HOULTON	6	11	63	11	10%	90%	-	5,000	1				1M	2	-
PENOBSCOT RIVER	MEDWAY	8	9	63	23	5%	95%	-	700				4	-	7	-
BOYDON LAKE	PERRY	7	9	63	90	1%	99%	-	1,500				4	1,702A	2	-
W BR SALMON BROOK	WASHBURN	6	14	63	11	10%	90%	-	8,000	1				1M	2	-
PRESTILE STREAM	WESTFIELD	6	21	63	22	95%	5%	-	-			3		-	1	-
PRESTILE STREAM	WESTFIELD	7	10	63	22	100%	-	-	50			3		-	1	-
MICHIGAN																
MAYNER LAKE	BRIGHTON	7	13	63	90	99%	1%	-	523			3		-	1	-
GRAND RIVER	LANSING	8	18	63	31	-	100%	-	250		2			-	4	-
MAPLE RIVER	OVID	8	14	63	22	2%	98%	-	-		2			1M	1	-
SHIAWASSEE RIVER	OWOSSO	6	7	63	31	14%	86%	-	2,622		2			-	-	-
SHIAWASSEE RIVER	OWOSSO	7	2	63	24	8%	92%	-	14,315		2			2M	-	-
PORTAGE CREEK	PORTAGE	9	23	63	33	28%	72%	-	312			3		1M	-	2
SEBEWAING BAY	SEBEWAING	10	9	63	22	16%	84%	-	37				4	-	2	-
NO BR PINE RIVER	STERLING	9	23	63	13	25%	75%	-	87				4	-	-	-
MINNESOTA																
ST LOUIS RIVER	CLOQUET	8	5	63	23	-	-	-	-				-	-	-	-
MID FK ZUMBRO RIV	DODGE CENTER	8	25	63	22	-	100%	-	2,000		2			2M	6	-
CANNON RIVER	FARIBAULT	8	21	63	22	1%	99%	-	4,000		2			5M	1	-
VERMILLION RIVER	FARMINGTON	6	30	63	22	-	100%	-	-			3		1M	-	-
DIETZ LAKE	MONTGOMERY	8	9	63	31	-	100%	-	-		2			20A	-	-
BEAVER CREEK	OLIVIA	8	19	63	22	-	100%	-	-		2			5M	-	-
CHUBB CREEK	RANDOLF	7	5	63	13	-	100%	-	-			3		6M	-	-
MISSISSIPPI RIVER	WINONA	10	26	63	90	5%	95%	-	5,500		2			1M	-	12
MISSOURI																
RILEYS FARM POND	ALBA	9	1	63	11	90%	10%	-	50	1				1A	2	-
HINKSON CREEK	COLUMBIA	8	18	63	21	-	100%	-	5,000		2			1M	3	-
BIG CEDAR CREEK	COLUMBIA	8	18	63	21	20%	80%	-	25,000		2			30M	6	-
BLACKWATER RIVER	EMMA	7	4	63	11	10%	90%	-	450				4	2M	3	-
SALINE CREEK	FENTON	5	7	63	50	1%	99%	-	9,000	1				1M	1	-
MONTROSE LAKE	LADUE	2	19	63	24	20%	80%	-	10,500		2			1M	-	5
CANAL-MONTROSE L	LADUE	1	2	63	35	33%	67%	33%	1,500		2			1M	1	-
HONEY CREEK	MARIONVILLE	5	14	63	31	20%	80%	-	-		2			1M	7	-
SALT FORK CREEK	MARSHALL	2	6	63	50	20%	80%	-	-		2			12M	5	-
SO FORK SALT RIV	MEXICO	2	13	63	31	20%	80%	-	1,500		2			5M	75	-
SO FORK SALT RIV	MEXICO	7	6	63	31	10%	90%	-	5,000		2			-	-	-
WILSON CREEK	SPRINGFIELD	7	19	63	24	10%	90%	-	350		2			4M	2	-
WHITTENBURG BRAN	STEELVILLE	10	19	63	27	60%	40%	50%	5,000	1				1M	1	-
CUILRE RIVER	TROY	7	14	63	11	50%	50%	-	500		2			1M	1	-
A CREEK	URICH	7	14	63	32	-	100%	-	100			3		1M	1	-
MONTANA																
HOPE CREEK	ELLISTON	3	14	63	11	100%	-	-	-			3		-	-	-
MILL CREEK	FRENCHTOWN	6	26	63	11	50%	50%	-	4,000	1				2M	1	-

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12 Fertilizer
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24 Chemicals
25 Petroleum
26 Metals
27 Combinations
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32 Refuse Disposal
33 Water System
34 Swimming Pool
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41 Rail
42 Truck
43 Barge or Boat
44 Pipe Line

50 Other Operations

99 Unknown

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RIVER OR LAKE AFFECTED	NEAREST TOWN OR CITY	DATE OF KILL: MONTH	DAY	YEAR	OPERATION INDICATED AS RESPONSIBLE FOR KILL (SEE CODES BELOW)	TYPE OF FISH KILLED: PERCENT GAME	PERCENT PANFISH	PERCENT OF KILL KNOWN USE OF COMMERCIAL VALUE	ESTIMATED NUMBER OF FISH KILLED	SEVERITY: TOTAL (1)	HEAVY (2)	MODERATE (3)	LIGHT (4)	ESTIMATED MILES OF STREAM AFFECTED	DURATION OF CRITICAL EFFECT: DA	WE
NEBRASKA																
ELKHORN RIVER	ARLINGTON	10	2	63	32	1%	99%	25%	2,200				4	8M	2	-
STREAM UNNO DRAIN	NINATARE	6	15	63	13	-	100%	-	-				6	2M	-	6
INDIAN CREEK	ODELL	10	18	63	44	-	100%	-	-		2			1M	-	-
HOOPER CREEK	PALMYRA	9	1	63	24	10%	90%	20%	200	1				3M	-	-
FRANKLIN IR CANAL	REPUBLICAN CITY	7	29	63	11	90%	10%	-	-		2			-	-	-
L DUBOIS FARMPOND	STRANG	5	18	63	11	100%	-	-	-		2			3A	18	-
CAN MEEKER DRFTWD	TRENTON	7	23	63	11	95%	5%	-	-		2			-	-	-
NEW HAMPSHIRE																
CONTOOCOOK RIVER	GREENFIELD	5	2	63	28	100%	-	-	-				4	45M	12	-
NASHUA RIVER	HOLLIS	7	16	63	23	-	100%	-	-		2			18M	10	-
MERRIMACK RIVER	MANCHESTER	7	27	63	20	1%	99%	-	-		2			5M	3	-
NEW JERSEY																
ONGS CREEK	BROWN MILLS	6	4	63	30	-	100%	-	300		2			-	3	-
DELAWARE RIVER	BURLINGTON	6	22	63	90	-	100%	-	-		2			-	-	-
PEQUANNOCK RIVER	BUTLER	1	11	63	24	5%	95%	-	350			3		1M	1	-
JOHNSON LAKE	CRANBERRY LAKE	1	-	63	90	10%	90%	-	3,000		2			-	-	-
CEDAR BROOK	CRANBURY	11	22	63	90	20%	80%	-	-		2			1M	14	-
RAMWAY RIVER	CRANFORD	5	29	63	42	-	100%	-	50				4	1M	5	-
BONEGUT CREEK	DUNELLEN	3	19	63	23	100%	-	-	100			3		1M	7	-
METEDECONK RIVER	LAURELTON	6	9	63	90	10%	90%	-	800			3		2M	2	-
METEDECONK RIVER	LAURELTON	7	20	63	90	-	100%	2%	800			3		-	-	-
MARLOW LAKE	MIDLAND PARK	12	5	63	26	-	100%	-	300		2			2A	-	-
ROCKAWAY RIVER	MONTVILLE	8	3	63	20	-	100%	-	200			3		-	-	12
AT TABOR BROOK	MORRIS PLAINS	7	28	63	20	30%	70%	-	150			3		1M	2	-
BUTTONWOOD RUN	MOUNT HOLLY	6	13	63	90	-	100%	-	25				4	1M	-	5
DELAWARE RIVER	NATIONAL PARK	6	5	63	90	-	100%	80%	-			3		-	6	-
UPPR SWIMMING RIV	NEW SHREWSBURY	8	16	63	90	-	-	100%	200				4	-	-	-
[illegible] CREEK	PORT ELIZABETH	6	2	63	28	-	100%	90%	3,000			3		-	3	-
NURSERY POND	UPPER SADDLE R	4	6	63	11	-	100%	-	100				4	11	-	-
TWIN LAKES	WANAQUE BORO	2	16	63	42	-	100%	-	50				4	-	-	-
NO BR ROCKAWAY CR	WHITEHOUSE	7	29	63	22	-	100%	-	1,000		2			-	-	8
WOODBRIDGE POND	WOODBRIDGE	11	21	63	26	10%	90%	-	-	1				-	-	-
NEW YORK																
FIVE MILE CREEK	ALLEGANY	10	28	63	42	15%	85%	-	375				4	1M	1	-
SAW MILL RIVER	ARDSLEY	8	28	63	24	5%	95%	-	2,000			3		3M	-	12
CLOVE CREEK	BEACON	9	9	63	50	10%	90%	-	2,000		2			1M	2	-
CRANE BROOK	CLYDE	7	9	63	13	5%	95%	-	3,000				-	6M	-	-
ROUNDOUT CREEK	ELLENVILLE	9	1	63	26	20%	80%	-	20,000		2			6M	-	12
OWASCO INLET	GROTON	8	7	63	28	-	100%	-	1,000			3		1M	-	6
WEST CREEK	HAMLIN	10	16	63	22	10%	90%	-	-		2			5M	8	-
BUTTONWOOD CREEK	HILTON	7	1	63	11	-	100%	-	250		2			2M	-	-
HONEOYE CREEK	HONEOYE FALLS	7	8	63	26	10%	90%	-	3,000	1				1M	1	-
CONESUS LK OUTLET	LAKEVILLE	10	21	63	22	5%	95%	-	2,500			3		2M	-	-
N Y ST BARGE CAN	LOCKPORT	7	31	63	31	5%	95%	-	75,000		2			17M	2	12
JOHNSON CREEK	LYNDONVILLE	4	9	63	20	-	100%	-	2,000			3		2M	1	-
CANANDAIGUA OUTLT	MANCHESTER	9	23	63	22	10%	90%	-	45,000		2			6M	17	-
NINE MILE CREEK	MARCELLUS FALLS	6	4	63	23	4%	96%	-	50,000		2			8M	1	-
VALATIE KILL	NASSAU	3	31	63	24	-	-	-	-				-	-	-	-
N Y ST BARGE CAN	NEWARK	10	7	63	22	5%	95%	-	45,000		2			-	17	-
VAN COURTLAND LK	NEW YORK CITY	3	23	63	20	-	100%	-	200				4	-	2	-
KEUKA LAKE OUTLET	PENN VAN	9	18	63	22	10%	90%	-	25,000		2			3M	4	12
PARSONS CREEK	ROME	10	12	63	26	-	100%	-	200				4	-	-	-
VAN CLEEF LAKE	SENECA FALLS	10	8	63	22	10%	90%	-	55,000		2			10A	1	12
BLACK CREEK	STAFFORD	10	4	63	13	-	100%	-	4,500			3		1M	2	-
GANARGUA CREEK	VICTOR	6	25	63	31	-	100%	-	5,000	1				2M	-	-
OATKA CREEK	WARSAW	8	19	63	26	5%	95%	-	200			3		2M	1	-
WAWAYANDA CREEK	WARWICK	8	9	63	24	10%	90%	-	40,000		2			10M	3	-

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NORTH CAROLINA																
ABERDEEN CREEK	ABERDEEN	6	6	63	90	5%	95%	-	1,000				4	4M	-	-
CEDAR CREEK	FRANKLINTON	7	2	63	11	30%	70%	-	800			3		2M	3	-
LUMBER RIVER	LUMBERTON	6	24	63	22	28%	72%	-	4,200			3		8M	-	6
BEAR CREEK	ROBBINS	5	23	63	31	5%	95%	10%	4,000		2			6M	-	-
ROANOKE RIVER	WELDON	4	21	63	23	90%	10%	5%	100,000		2			100M	7	-
OHIO																
TRIB ROCKY RIVER	CLEVELAND	6	11	63	13	-	100%	-	315				4	1M	1	-
SOUTH CREEK	CLYDE	6	6	63	22	-	100%	-	50				4	2M	1	-
GUILFORD LAKE	COLUMBIANA	6	6	63	28	90%	10%	-	483				4	-	1	-
WOLF CREEK	DAYTON	5	20	63	11	10%	90%	-	8,932			3		3M	5	-
AUGLAIZE R TRIBS	DEFIANCE	12	9	63	90	10%	90%	-	92,711		2			7M	7	-
OLENTANGY RIVER	GALION	7	2	63	90	1%	99%	-	389	1				1M	-	-
BLANCHARD RIVER	GLANDORF	10	2	63	90	-	100%	-	466		2			-	-	-
HOCK FORK CREEK	HILLSBORO	3	29	63	20	-	-	-	78,808		2			5M	2	-
WALNUT RUN	LONDON	9	16	63	13	1%	99%	-	326		2			-	-	-
MALLET CREEK	MEDINA	6	10	63	13	-	100%	-	800				4	1M	-	-
SO FK LICKING RIV	MILLERSPORT	9	13	63	13	-	100%	-	11				4	-	-	-
WHETSTONE CREEK	MT GILEAD	9	4	63	31	50%	50%	-	2,521		2			-	-	-
RACCOON CREEK	NEWARK	6	14	63	24	5%	95%	-	150				4	2M	2	-
BLANCHARD RIVER	OTTAWA	10	2	63	22	75%	25%	-	466		2			4M	-	-
LEATHERWOOD CREEK	QUAKER CITY	8	8	63	21	100%	-	-	17				4	3M	-	-
SANDUSKY RIVER	TIFFIN	10	9	63	31	75%	25%	-	958		2			5M	-	-
BIG SANDY CREEK	WAYNESBURG	9	17	63	90	-	100%	-	28				4	4M	-	-
OKLAHOMA																
LITTLE RIVER	WRIGHT CITY	6	24	63	27	40%	60%	-	-		2			-	2	-
OREGON																
ROW RIVER	COTTAGE GROVE	8	10	63	20	80%	20%	-	2,500		2			3M	-	8
TRIB WILLAMETTE R	EUGENE	2	22	63	22	100%	-	-	500	1				1M	-	-
SLOUGH WILLAMET R	EUGENE	2	22	63	22	80%	20%	-	350	1				6A	-	-
TRIB WILLAMETTE R	EUGENE	10	11	63	90	-	100%	-	1,000		2			3M	3	-
BORROW PIT WILL R	EUGENE	12	26	63	32	30%	70%	-	4,500	1				-	-	-
JOHNSON CR T WI R	GRESHAM	6	13	63	28	-	-	-	175	1				-	-	-
PHELPS CREEK	HOOD RIVER	3	15	63	11	100%	-	-	500			3		1M	-	-
ODELL CREEK	ODELL	5	6	63	11	100%	-	-	1,000			3		1M	-	-
EAST FK HOOD RIV	PARKDALE	1	-	63	90	-	-	-	-				-	15M	-	-
TRIB N UMPQUA RIV	ROSEBURG	11	-	63	23	100%	-	-	-				-	1M	-	-
LOW RAYMOND CREEK	SCAPPOOSE	6	29	63	90	96%	4%	16%	2,000	1				1M	-	3
PENNSYLVANIA																
BARSHINGER CREEK	ADAMSVILLE	6	-	63	22	20%	80%	-	3,090		2			1M	1	-
TRIB LEHIGH RIVER	ALLENTOWN	7	25	63	28	45%	55%	-	-			3		-	-	12
WEST SWAMP CREEK	BECHTELSVILLE	12	13	63	42	20%	80%	-	-			3		3M	-	-
RYSTN BR JUNIATA	BEDFORD	9	20	63	11	20%	80%	-	1,758			3		1M	-	12
RYSTN BR JUNIATA	BEDFORD	10	1	63	31	50%	50%	-	1,795		2			1M	-	3
BUFFALO RUN	BELLEFONTE	5	5	63	24	10%	90%	-	500		2			1M	2	-
LEHIGH RIVER	BETHLEHEM	6	1	63	26	50%	50%	-	200				4	-	-	4
CONEWAGO CREEK	BIGLERVILLE	10	21	63	22	5%	95%	-	96,032	1				3M	14	-
NESHAMINY CREEK	BRIDGE VALLEY	8	18	63	11	40%	60%	-	205	1				-	2	-
PINE RUN CREEK	BRIDGE VALLEY	8	19	63	22	40%	60%	-	254			3		1M	2	-
EVITTS CREEK	CENTERVILLE	10	1	63	28	90%	10%	-	217			3		1M	1	-
SE BR SAUCON CR	COOPERSBURG	8	23	63	11	30%	70%	-	20,000		2			5M	2	-
BULL CREEK	CULMERVILLE	8	-	63	21	20%	80%	-	10,000		2			9M	-	-
BUSHKILL CREEK	EASTON	7	9	63	11	50%	50%	-	-			3		-	-	-

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PENNSYLVANIA CONT																
CONOY CREEK	ELIZABETHTN BOR	3	31	63	90	50%	90%	-	383				4	-	7	-
IND-PERKIOMAN CRS	EMMAUS	6	4	63	26	35%	65%	-	-	1				1M	2	-
STANDING STONE CR	ENNISVILLE	11	25	63	42	30%	70%	-	11,924		2			9M	3	-
BOW CREEK	FAIRVIEW TWP	8	6	63	20	90%	50%	-	-				4	1M	2	-
NO BR MUDDY CREEK	FELTON	5	3	63	11	10%	90%	-	4,120	1				-	1	-
FRENCH CREEK	FRANKLIN	7	6	63	25	60%	40%	-	500			3		2M	1	-
SO BR CODORUS CR	GLEN ROCK	6	7	63	50	10%	90%	-	3,838			3		1M	-	12
HARKEL RUN	HAMPTON	6	21	63	13	10%	90%	-	2,775		2			1M	1	-
POLK VALLEY RUN	HELLERTOWN	6	28	63	11	25%	75%	-	100				4	-	3	-
SPRING CREEK	HERSHEY	6	25	63	22	25%	75%	-	2,500		2			3M	1	-
TRIB SUSQUEHANNA	HIGHSPIRE	3	12	63	25	35%	65%	-	100				4	1M	1	-
LTL NESHAMINY CR	IVYLAND	1	17	63	25	40%	60%	-	4,000	1				15M	8	-
BIG CONESTOGA CR	LANCASTER	6	27	63	31	50%	50%	-	6,006		2			-	-	-
LTL CONESTOGA CR	LANCASTER	8	31	63	24	35%	65%	-	3,400		2			1M	1	-
SPRING CREEK	LEMONT	5	29	63	24	50%	50%	-	1,450		2			2M	1	-
SPRING CREEK	LEMONT	8	7	63	24	35%	65%	-	1,650	1				2M	1	-
LTL CONESTOGA CR	LETORT	8	9	63	11	25%	75%	-	2,200		2			1M	1	-
MILL RUN	MEADVILLE	7	19	63	22	40%	60%	-	500			3		1M	-	6
CLEARVIEW RESVR	MIFFLINTOWN	4	26	63	33	75%	25%	-	500		2			1M	8	-
NESCOPECK CREEK	NESCOPECK	3	8	63	44	-	-	-	-					-	-	-
RYSTN BR JUNIATA	NEW BALTIMORE	4	16	63	50	-	-	-	-				-	-	-	-
BIG RUN	NEW CASTLE	8	2	63	21	35%	65%	-	-	1				-	7	-
W BR CODORUS CR	NEW SALEM	7	14	63	23	80%	20%	-	50				4	1M	-	12
MILL CREEK	PENNDEL	4	29	63	22	35%	65%	-	-			3		-	-	-
CATAWISSA CREEK	RINGTOWN	7	25	63	21	10%	90%	-	2,100		2			4M	5	-
FURNACE CREEK	ROBESONIA	8	9	63	28	50%	50%	-	-		2			2M	3	-
SANDY CREEK	SANDY LAKE	7	3	63	22	50%	50%	-	-		2			3M	3	-
BUFFALO CREEK	TAYLORSTOWN	8	10	63	22	30%	70%	-	-				4	1M	1	-
OIL CREEK	TITUSVILLE	12	25	63	26	20%	80%	-	250				4	-	-	12
SO BR FRENCH CR	UNION CITY	6	1	63	31	52%	48%	-	12,027	1				3M	-	-
SO BR FRENCH CR	UNION CITY	6	24	63	28	10%	90%	-	1,700		2			1M	-	-
SO BR FRENCH CR	UNION CITY	10	3	63	27	35%	65%	-	1,350				4	1M	1	-
PIGEON CREEK	VAN VOORHIS	10	5	63	41	-	100%	-	-		2			3M	2	-
TRIB JORDAN CREEK	WALBERT	4	26	63	22	30%	70%	-	-	1				2M	1	-
ALLEGHENY RIVER	WARREN	6	15	63	28	50%	50%	-	3,000		2			1M	1	-
LEBOEUF CREEK	WATERFORD	7	8	63	11	5%	95%	-	2,600		2			1M	1	-
W BR SUSQUEHANNA	WILLIAMSPORT	9	9	63	21	40%	60%	-	50,000	1				30M	5	-
DELAWARE RIVER	YARDLEY	6	14	63	24	60%	40%	-	1,000			3		2M	2	-
RHODE ISLAND																
WASHPANG POND	CRANSTON	7	-	63	20	100%	-	-	5,000		2			-	-	-
WOONASQUATKT RESV	NO PROVIDENCE	9	2	63	28	15%	85%	-	4,000			3		1A	2	-
UPPER CANADA BR	NO PROVIDENCE	9	10	63	50	2%	98%	-	-	1				20M	10	-
WOONASQUATKT RESV	SMITHFIELD	5	30	63	31	-	100%	-	5,000			3		150A	5	-
SOUTH CAROLINA																
LYNCHES RIVER	JOHNSONVILLE	9	5	63	20	57%	43%	-	30,000	1				10M	-	8
TENNESSEE																
NORTH HOUSE CREEK	ATHENS	6	24	63	41	-	-	-	5,000		2			11M	12	-
NORTH HOUSE CREEK	CALHOUN	5	24	63	21	-	-	-	-				-	-	-	-
HIWASSEE RIVER	CHARLESTON	1	11	63	23	1%	99%	-	2,528			3		11M	10	-
WACONDA BAY	CHATTANOOGA	2	11	63	20	-	100%	-	125				4	3A	1	-
WACONDA BAY	CHATTANOOGA	2	17	63	90	1%	99%	-	50				4	20A	-	-
WACONDA BAY	CHATTANOOGA	4	27	63	24	8%	92%	40%	6,000			3		50A	3	-
WACONDA BAY	CHATTANOOGA	10	23	63	24	3%	97%	3%	15,000		2			350A	-	12
CANDIES CREEK	CLEVELAND	3	12	63	44	-	-	-	-				4	1M	1	-
BOILING FORK CR	COWAN	6	19	63	28	26%	74%	-	12,600	1				3M	-	-
RICHLAND CREEK	DAYTON	6	7	63	22	13%	87%	6%	800		2			1M	-	12
SINKING CREEK	JOHNSON CITY	12	15	63	28	-	-	-	-			3		-	-	-
MCKELLAR LAKE	MEMPHIS	9	8	63	31	1%	99%	-	630,000		2			-	3	-
CUMBERLAND RIVER	NASHVILLE	9	20	63	50	-	100%	-	34				4	1M	-	2

10 Agricultural Operations
11 Poultry (Confinement Operations, etc.)
12 Feedlots
13 Manure, Silo, Pesticide Drainage, etc.

20 Industrial Operations
21 Mining
22 Food & Kindred Products
23 Paper & Allied Products
24 Chemicals
25 Petroleum
26 Rubber
27 Construction
28 Other

30 Municipal Operations
31 Sewerage System
32 Refuse Disposal
33 Water System
34 Swimming Pool
35 Power

40 Transportation Operations
41 Rail
42 Truck
43 Barge or Boat
44 Pipe Line

50 Other Operations
99 Unknown

REPORT OF POLLUTION-CAUSED FISH KILLS

CUMULATIVE LISTING OF REPORTS RECEIVED AS OF DATE OF LISTING

RIVER OR LAKE AFFECTED	NEAREST TOWN OR CITY	DATE OF KILL: MONTH	DAY	YEAR	OPERATIONS INDICATED AS RESPONSIBLE FOR KILL: MAIN GROUP VALUE	TYPE OF FISH KILLED: GAME	FORAGE	PERCENT OF KILL WHICH WAS OF COMMERCIAL VALUE	ESTIMATED NUMBER OF FISH KILLED	SEVERITY: TOTAL	HEAVY	MODERATE	LIGHT	EXTENT OF KILL OR AREA AFFECTED	DURATION OF PRINCIPAL EFFECT: DA	HR
TEXAS																
CHOCOLATE BAYOU	ALVIN	6	19	63	50	50%	50%	-	-			3		-	1	-
CHOCOLATE BAYOU	ALVIN	12	5	63	24	1%	99%	-	-			3		1M	1	-
ANAHUAC CHANNEL	ANAHUAC	7	14	63	90	-	100%	-	2,000			3		-	-	-
TURTLE BAYOU	ANAHUAC	8	15	63	90	-	100%	-	5,000		2			-	1	-
DICKINSON BAYOU	ARCADIA	9	6	63	11	50%	50%	-	-				4	-	1	-
COLORADO RIVER	AUSTIN	1	31	63	31	5%	95%	-	15,000		2			11M	-	-
COLORADO RIVER	AUSTIN	12	10	63	31	95%	5%	-	1,000				4	-	-	-
COLORADO RIVER	BALLINGER	7	10	63	11	2%	98%	-	-				4	1M	1	-
TOYAH CREEK	BALMORHEA	7	16	63	11	95%	5%	-	-			3		2M	30	-
PEYTON CREEK	BAY CITY	10	21	63	25	25%	75%	-	1,000		2			-	-	-
SCOTTS BAY	BAYTOWN	9	6	63	90	-	100%	-	-				-	100A	2	-
CHEEK CREEK	BEAUMONT	11	27	63	24	-	100%	-	250				4	1M	-	-
NOLAN CREEK	BELTON	10	24	63	31	80%	20%	90%	1,000		2			-	-	-
STREAM	BRADY	9	13	63	31	-	-	-	-				4	-	-	-
VILLAGE CREEK	BURLESON	12	27	63	31	-	100%	-	20			3		10M	-	-
LAKE	CISCO	3	22	63	50	80%	20%	-	-				-	-	-	-
CHAMBERS CREEK	CORSICANA	8	27	63	11	10%	90%	-	-		2			-	-	-
UNNAMED STREAM	CUSHING	8	4	63	27	34%	66%	-	-		2			-	3	-
CYPRESS CREEK	CYPRESS	7	24	63	25	50%	50%	-	300				4	10M	5	-
LAKE O THE PINES	DAINGERFIELD	3	1	63	24	50%	50%	-	-				4	-	-	-
LAKE O THE PINES	DAINGERFIELD	5	8	63	24	25%	75%	-	-		2			100A	-	6
COOPER CREEK	DENTON	2	2	63	31	70%	30%	80%	-	1				1M	7	-
ELM CREEK	EAGLE PASS	3	30	63	12	20%	80%	-	1,000			3		-	1	-
SAN ANTONIO RIVER	ELMENDORF	3	1	63	31	20%	80%	40%	1,800			3		-	2	-
OFFATS BAYOU	GALVESTON	11	22	63	31	-	100%	-	500				4	30M	1	-
LONG CANE CREEK	GOODRICH	8	31	63	50	40%	60%	-	-			3		2M	-	2
PRIVATE PONDS	HIGH ISLAND	10	23	63	30	95%	5%	-	1,000		2			5A	2	-
ROCK CREEK	HILLSBORO	2	-	63	13	-	-	-	-		2			6M	-	-
SLUSHER LAKE BEAN	JACKSBORO	5	3	63	25	75%	25%	-	-			3		-	7	-
DEER CREEK	JOY	10	10	63	25	50%	50%	-	-			3		-	3	-
HIGHLANDS BAYOU	LAMARQUE	12	11	63	31	-	100%	-	100				4	-	1	-
PRIVATE LAKE	LAMPASAS	4	2	63	11	30%	70%	-	-			3		45A	14	-
TRINITY RIVER	LIBERTY	8	19	63	90	20%	80%	-	50				4	1M	3	-
STREAM CREEK	MCGREGOR	6	21	63	11	10%	90%	-	200		2			1M	2	-
STREAM	MACDONA	9	16	63	11	-	100%	-	1,000				-	-	-	-
LAKE TRAVIS	MARBLE FALLS	10	27	63	50	50%	50%	-	3,000	1				-	-	10
BOSQUE RIVER	MERIDIAN	12	25	63	31	90%	10%	-	50			3		-	-	-
TRINITY RIVER	MOSS HILL	6	17	63	21	5%	95%	-	1,000			3		1M	2	-
FRED COX LAKE	PEELTOWN	8	31	63	50	75%	25%	-	-	1				1A	1	-
CANADIAN RIVER	PHILLIPS	1	-	63	25	-	100%	-	-				4	10M	31	-
NR POWDER HORN LK	PORT LAVACA	1	24	63	44	10%	90%	10%	200		2			1A	2	-
INTERCOASTAL CAN	PORT OCONNOR	3	19	63	43	-	100%	-	-				4	1M	2	-
ARROYO COLORADO	RIO HONDO	6	17	63	11	1%	99%	50%	5,000		2			25M	3	-
NAVASOTA RIVER	ROBERTSON CO	8	20	63	30	25%	75%	-	-		2			-	-	-
RED OAK CREEK	ROCKETT	6	17	63	11	10%	90%	-	-	1				-	10	-
LITTLE RIVER	ROGERS	8	19	63	11	60%	40%	-	2,500			3		2M	1	-
SAN ANTONIO RIVER	SAN ANTONIO	4	8	63	31	-	100%	-	100			3		1M	-	12
MEDINA RIVER	SAN ANTONIO	9	14	63	11	10%	90%	10%	1,000			3		-	3	-
LIT PINE IS BAYOU	SARATOGA	2	2	63	25	60%	40%	-	-	1				30M	30	-
CACHE CREEK	SEYMOUR	6	13	63	28	2%	98%	-	300	1				-	-	-
WHITE OAK CREEK	TALCO	6	-	63	44	1%	99%	-	200				4	5M	2	-
TEX CITY DIKE AR	TEXAS CITY	6	18	63	90	-	100%	-	2,000			3		-	1	-
GALVESTON BAY	TEXAS CITY	7	5	63	90	-	100%	-	1,000			3		20A	-	12
GALVESTON BAY	TEXAS CITY	7	17	63	20	-	100%	-	2,000			3		20A	-	6
GALVESTON BAY	TEXAS CITY	11	2	63	90	-	100%	-	7,000			3		2M	1	-
GALVESTON BAY	TEXAS CITY	11	18	63	90	-	100%	-	5,000			3		10A	1	-
GUADALUPE RIVER	VICTORIA	8	4	63	24	-	100%	-	50				4	1M	2	-
UTAH																
DEEP CREEK	DUCHESNE	1	31	63	42	-	-	-	-	1				-	1	-
JORDAN RIVER	FARMINGTON	8	13	63	90	-	100%	-	2,500			3		-	1	-
WEBER RIVER	OGDEN	2	18	63	90	-	-	-	-			3		-	4	12
UTAH LAKE	OREM	8	7	63	26	85%	15%	-	175				4	-	1	-
SPRING CREEK	PROVO	1	28	63	24	-	-	-	-		2			-	1	-
UTAH LAKE	PROVO	5	20	63	90	100%	-	-	-				4	-	-	-
GALENA CANAL	SALT LAKE CITY	5	29	63	90	-	100%	-	-		2			3M	2	-
SPRING CREEK	SPRINGVILLE	7	29	63	11	95%	5%	-	2,500		2			1M	2	-

10 Agricultural Operations
11 Fisheries (Commercial, Processors, etc.)
12 Petroleum
13 Mines, Silo, Powder Dumps, etc.

20 Industrial Operations
21 Mining
22 Food & Kindred Products
23 Paper & Allied Products
24 Chemicals
25 Petroleum
26 Metals
27 Combinations
28 Other

30 Municipal Operations
31 Sewerage System
32 Refuse Disposal
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River or Lake Affected	Nearest Town or City	Date of Kill: Month	Day	Year	Operations Indicated as Responsible for Fish Kill: See Codes Below	Type of Fish Killed: Percent Game	Percent Forage	Percent of Kill Which Was of Commercial Value	Estimated Number of Fish Killed	Severity: Total (1)	Heavy (2)	Moderate (3)	Light (4)	Estimated Miles or Acres Affected	Duration of Observed Effect: Da	Hrs
VERMONT																
FAYVILLE BROOK	EAST ARLINGTON	4	29	63	28	100%	-	-	-			3		1M	1	-
VIRGINIA																
DAN RIVER	DANVILLE	9	28	63	28	75%	25%	-	8,000		2			10M	-	-
BLACKWATER	FRANKLIN	4	10	63	23	-	-	100%	3,000			3		-	-	-
NOTTOWAY RIVER	JARRATT	10	23	63	23	20%	80%	-	8,000			3		2M	2	-
TABERNACLE CREEK	VIRGINIA BEACH	8	30	63	11	-	-	-	90,000		2			-	-	-
JAMES RIVER	WINGINA	8	19	63	24	-	100%	-	4,000			3		5M	-	-
WASHINGTON																
CHELATCHIE CREEK	AMBOY	3	20	63	28	100%	-	-	-				4	1M	-	-
UNION RIVER	BELFAIR	3	19	63	90	100%	-	-	15				4	-	-	-
SALMON CREEK	HAZEL DELL	2	4	63	90	99%	1%	-	-				4	1M	-	-
COWEEMAN RIVER	KELSO	8	19	63	42	100%	-	-	59,000		2			14M	4	-
MILL CREEK	KENT	1	5	63	20	100%	-	-	10				-	1M	-	-
MILL CREEK	KENT	3	5	63	26	98%	2%	-	1,000		2			5M	-	9
THORNTON CREEK	LAKE CITY	3	8	63	90	100%	-	-	500		2			1M	-	-
FISH TRAP CREEK	LYNDEN	6	4	63	22	95%	5%	-	-				4	-	-	-
WALLA WALLA RIVER	WALLA WALLA	8	15	63	90	-	100%	-	60				4	-	-	-
SPRING SEEPGE STR	YAKIMA	11	18	63	11	100%	-	-	3,000		2			-	-	-
WEST VIRGINIA																
BLUESTONE RIVER	BRAMWELL	6	20	63	24	5%	95%	-	500		2			12M	-	-
KANAWHA RIVER	CHARLESTON	8	28	63	20	-	100%	-	5,000			3		3M	2	-
BUFFALO CR MON R	FARMINGTON	11	12	63	21	10%	90%	-	-	1				-	-	-
GUYANDOT RIVER	HUNTINGTON	9	9	63	26	10%	90%	-	-		2			3M	-	-
LITTLE COAL RIV	MADISON	9	23	63	21	20%	80%	-	-	1				15M	7	-
KANAWHA RIVER	NITRO	12	27	63	24	5%	95%	10%	100,000		2			9M	7	-
SPRING CREEK	SPENCER	9	4	63	50	5%	95%	-	3,000	1				4M	-	-
KANAWHA RIVER	WINFIELD	11	7	63	20	5%	95%	-	200			3		3M	25	-
WISCONSIN																
BLACK EARTH CREEK	CROSS PLAINS	7	25	63	31	99%	1%	-	300		2			1M	1	-
FOX RIVER	PORTAGE	10	14	63	28	-	100%	-	1,000	1				2M	3	-

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